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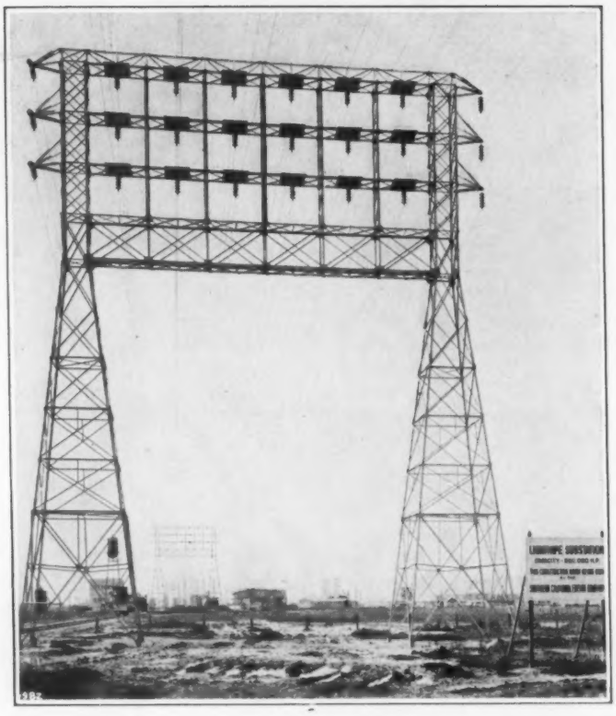

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Judge Bean held court and enforced judgment with his compelling Colt

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Electrical West

With which is consolidated the Journal of Electricity
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G. C. TENNEY, *Editor*

Volume 64 | San Francisco, May 1, 1930 | Number 5

Electrical Engineering Phases of SOUND PICTURES

By K. F. MORGAN
Electrical Research Products, Inc.

and

T. E. SHEA
Bell Telephone Laboratories, Inc.

Soundproof monitoring booth showing window through which monitor man observes action being photographed.

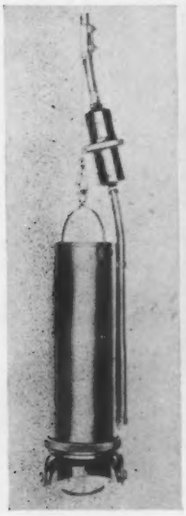
WITH the introduction of sound into motion pictures the "movie" industry literally and figuratively has been electrified. Laboratory research work directed toward the improvement of the telephone and radio have been combined with the motion picture and the silent screen has been given a voice.

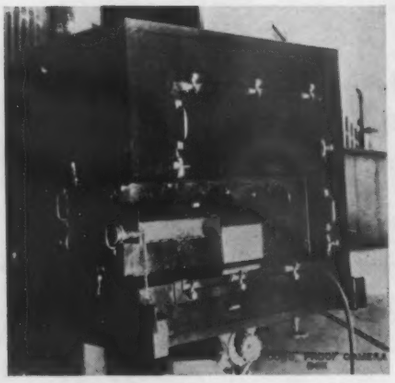
The sound picture of today is a combination of the silent motion picture and the electrical pickup, amplification, transmission, recording, and reproduction of sound. Essentials of the sound processes are the recording and synchronizing of sound on either film or disk records with a satisfactory method of synchronized reproduction. This electrical recording requires a method of transforming sound vibrations into electric currents; then the transmission, control and amplification of these currents; and finally, a method of changing the electrical energy into mechanical energy in order that a permanent record may be obtained, either by modulated light on a sensitized film or by the movement of a cutting stylus in soft wax.

Before entering into a discussion of the power requirements and electrical engineering phases of sound motion pictures, it is necessary to understand something of the various steps in the process and the duties of the equipment involved. Essential parts of a studio recording system consist of microphone pickups on the stage, a mixer and volume control in the monitor or "mixer" booth, system and monitor amplifiers, recording machines and a synchronous motor system for synchronizing the recorders with the cameras.

Recording stages are soundproofed, external noises being excluded through the use of double or triple walls with intervening dead-air spaces. The microphone or microphones are placed in positions to pick up satisfactorily the speech or music occurring on the set. The camera is enclosed in a soundproof case or "blimp" to exclude camera and motor noises from the microphones. Several

TECHNIQUE and apparatus of sound picture recording and reproduction, with special emphasis on their electrical engineering aspects, are described in this article which is a revised version of a paper presented before the A.I.E.E. Various steps in the processes of disk and film recording as they take place in the Western Electric systems are outlined. Power supply and control are discussed by the authors.





Microphone of the condenser transmitter type with associated amplifier used on sound stages (left) and soundproof box enclosing motion picture camera called a "blimp"

cameras are used in protographing each scene, so that different "shots" are available for the film cutters and editors.

Responsibility for the balance, quality and volume of the recording rests with the monitor man. He must be thoroughly familiar with the action being photographed and the acoustic conditions of the set, and he must locate the microphones properly for the best over-all results. He hears sounds from the stage only by means of electrical pickup and monitor horns, and thus is assured that his circuits are working properly.

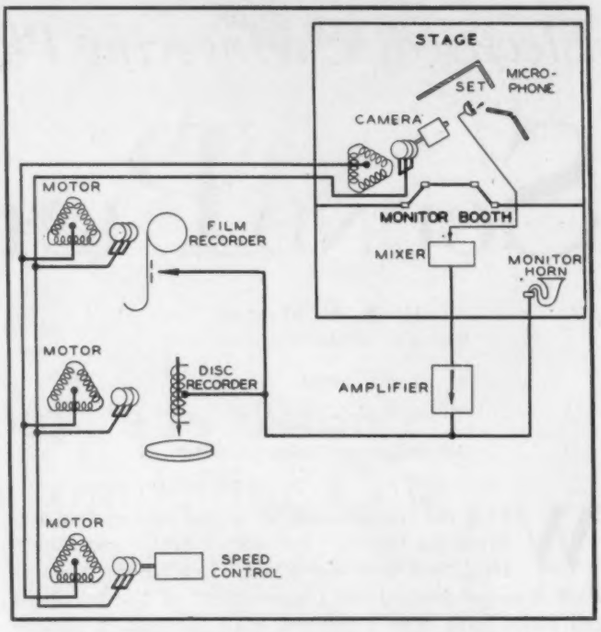
The mixer table which he operates is the centralized operating point of the system. Controls are located there for "fading" in and out various microphones, maintaining the volume balance between several microphones, and for regulating over-all volume; also for operating communication systems, signal lights, and relay control switches. A volume indicator provides a visual method for the monitor man to keep the sound volume range within the limits of the recording system.

All microphone circuits enter the monitor room, and after passing through the mixer for mixing and amplification are trunked to the recording building. This structure usually is separated from the sound stage because of the fire hazard. In it is concentrated all of the recording, power, and auxiliary equipment. In it also are located the wax-shaving room (for preparing wax records), battery room, motor-generator room, "dubbing" room (where sound records are copied or combined through re-recording), film loading room, recording rooms, test laboratory, and amplifier room. In the amplifier room are the system amplifiers, monitor amplifiers, and power control panels for all channels. A "channel" is the designation for all equipment associated with any one stage.

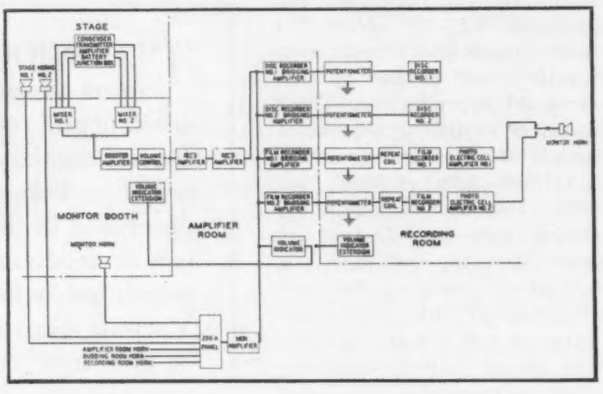
Two film recording and two disk recording machines usually are included in the recording room equipment. These are driven by synchronous motors in synchronism with the camera motors on the stage. Wax records are obtained for immediate "playbacks" to director, actors, and monitor man for judging the dramatic effect and quality of a recorded scene without waiting for a record to be processed or film to be developed.

In a typical sound recording system it is necessary to provide power supply to operate (*a*) the synchronized motor system for rotating simultaneously the camera, wax recording machine, and film recording machine; (*b*) the amplifier system; *(c)* the exciting lamp in the film recorder and the fields of the light-valve and wax recorder; *(d)* battery charging machines; *(e)* motors for rotating wax-shaving and wax-suction equipment; *(f)* miscellaneous supply for signaling systems, testing and other special purposes.

This power is derived from three sources: alternating current from the power mains; direct current from

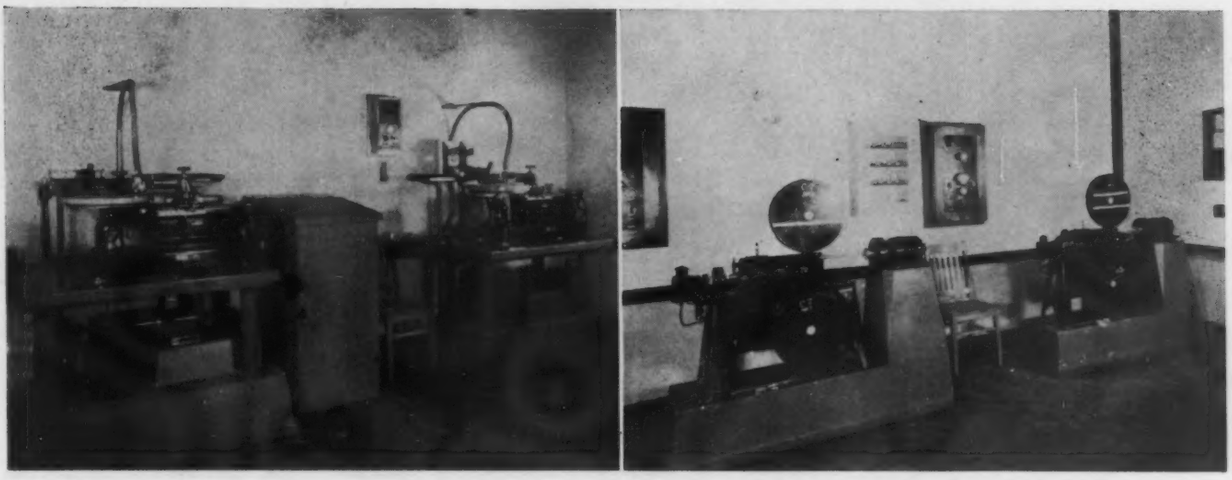


Schematic diagram of a recording system (above) and schematic diagram of one complete recording channel (below)



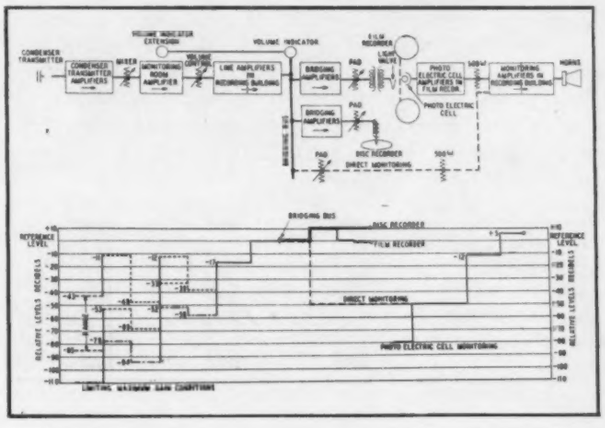
motor-generator sets; and direct current from the battery system.

For the operation of the synchronized motor system, 220-volt, three-phase power at 50 or 60 cycles, is sup-



Wax recording machines for disk recording (left) and film recording machines (right)

plied to the motors of the film-recording and disk-recording machines, and to the cameras. The total number of motors and the arrangement of the equipment for a channel will depend upon the requirements of the particular studio. This synchronized motor system makes it possible to start, stop, and run the cameras and recording equipment in exact synchronism and, when running, to keep all the apparatus at the exact speed necessary for the correct recording of sound. Each piece of apparatus driven from the synchronized motor system is provided with a separate motor. The motor for rotating the disk recorder is mounted on the motor table underneath the disk-recording machine. This is a four-pole, 50- or 60-cycle, three-phase, ¼-hp. motor of the wound-rotor type, provided with slip rings. The motor for the film-recorder machine is a four-pole, 50- or 60-cycle,



Schematic circuit of a recording channel together with volume level diagram

three-phase, ½-hp. model of a type similar to that used for the disk recorder. The camera drive motors are four-pole, 60-cycle, three-phase, ¼-hp. motors, and are mounted on the camera housing with a special gear and shaft extension to reduce vibration. To operate all of these motors, a supply of 220-volt, three-phase, 50- or 60-cycle energy is required with a power of approximately 3.5 kw. per channel.

The battery system provides power for the filament and plate circuits of the system amplifiers. For the filament supply of the amplifiers, a 12-volt, 480-amp.hr. battery is provided. One battery per channel with a minimum of two batteries available usually is specified. The plate battery for the amplifiers, of which one per channel is provided, with a minimum of two available, consists of a 360-volt, 12-amp.hr. battery which, for charging purposes, is split up into five 72-volt banks. A third battery provides power for the exciting lamp in the film recorder and the high-intensity electromagnetic fields of the light-valve and wax-recorder. This is a 12-volt, 480-amp.hr. battery similar to the amplifier filament battery. One per recording room is required. A fourth battery is provided to operate the signal system. This is of 12-volt, 80-amp.hr. capacity. A fifth battery is provided for testing and may be either a 24-volt or 12-volt battery, both being provided in certain installations. For operating the condenser transmitter amplifiers and booster amplifiers a sixth battery is provided. This battery, of 6-volt, 140-amp.hr. capacity, and having one regular and one spare unit, is not installed in the battery room, but is located on each stage, together with a charging rectifier.

For keeping these batteries in good condition a charging system consisting of two machines is provided, one for the filament and one for the plate batteries. The machine for charging the filament battery is a 15-volt, 200-amp., d.c. generator rotated by a 220-volt, three-phase, 50- or 60-cycle, 5-hp. motor. A filter, consisting of a choke coil and electrolytic condenser is provided with each of these machines to take out the commutator "ripples." For charging the plate battery, 110 volts d.c. is supplied by a motor-generator set consisting of a 110-volt, 12.5-kw. generator driven by a 220-volt, three-phase motor. This generator, in addition to providing current for charging the plate battery, also provides power for the wax-shaving machine motors, motor distributor, and arcs for projection machines.

Battery room (left) and charging equipment showing electrolytic condensers and control equipment mounted on wall (right)

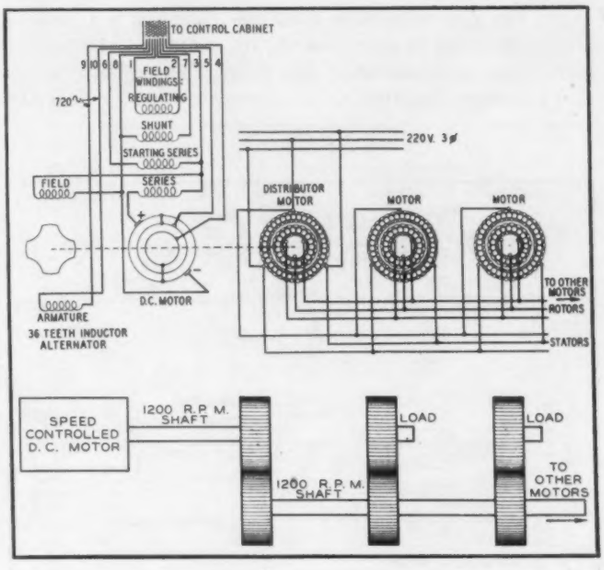
During the operation of wax-recording or wax-shaving machines the wax shavings are removed by suction. To operate these suction machines a 220-volt, three-phase, 2-hp. motor is provided for the wax-shaving machines, and a similar motor, but of only ½ hp., for each set of four recording machines.

To interlock electrically the motor system previously mentioned, a principle known for many years in the electrical power field is employed. It consists of connecting in parallel the stators and wire-wound rotors of polyphase slip-ring induction motors having similar electrical impedance characteristics and the placing of an alternating voltage across the stators. Each motor acts as a transformer. The rotors of all driving motors are brought into the same electrical phase relation that is presented by the distributor motor. This system gives a strong interlocking action between all motors, and mechanical rotation of the distributor rotor produces a corresponding rotation of all other interlocked rotors. Hence, if the rotor on the distributor is driven at a constant speed, all interlocked motors likewise are driven at the same speed independently of the power supply frequency, and the actual number of revolutions from start to stop is exactly the same for all motors.

This feature of having the same number of revolutions from start to stop is rather an important one. It permits the marking for synchronization of the sound film and picture film while stationary, and yet assures complete synchronization throughout when started. It also is important in the transferring of the sound record from one film or disk record to another film or disk in a "dubbing" process.

Accurate speed control for both the recording and reproducing of sound films is required for all types of sound pictures. It is well known that musical pitch varies directly with frequency and, therefore, in order that the reproduced sound may have the same pitch as the original, the record or film must run at an assigned constant speed.

A special assembly of equipment in a control cabinet provides the means for obtaining the constant speed of 1,200 r.p.m. All recording and reproducing equipment is driven by 1,200-r.p.m. motors. The driving unit is a compound-wound d.c. motor which has, in addition to the regular series field, a special series field which is used to give extra torque at starting and is cut out automatically before the motor reaches full speed. This motor also has a shunt regulating field in which the current is governed by the vacuum-tube control circuit.

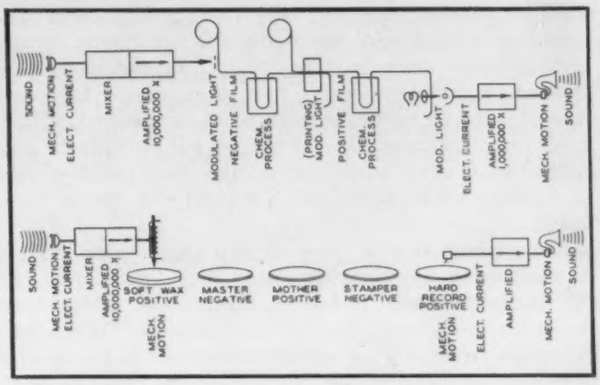


Schematic diagram of synchronous motor system (top) and mechanical analogy of same system (bottom)

The motor is equipped with a small inductor generator which delivers 720 cycles to the control box at 1,200 r.p.m. The armature winding of the motor is tapped at two opposite points, through slip rings, and by this

means 720-cycle alternating current is delivered to the control box for vacuum tube filament and plate supply.

Operation of the control circuit is governed by low pass filters which have a sharp 720-cycle cut-off. Any variation from the required speed of 1,200 r.p.m. causes a corresponding change in the frequency supplied to the speed-control equipment. Such variations automatically



Schematic diagram of recording and reproducing sound, showing intermediate processes

result in corrective action through the vacuum-tube circuits of the control cabinet, which provide a compensating action that keeps the motor speed within a fraction of one per cent.

The motor system usually is started and stopped by controls operated by the film-recorder attendant in the recording room. When a "take" is about to be made the signal is received to "interlock." One phase of the 220-volt, three-phase power supply then is closed, thus locking all the motors in a stationary position. Film in the cameras and film recorders is punched. A synchronizing start mark also is placed on the wax disk. Various colored signal lights controlled in the recording room, monitoring booth, and stage, when lighted indicate that all is in readiness. The system is started by closing the third wire of the three-phase, 220-volt power supply and the 110-volt d.c. supply for the d.c. distributor drive motor. A meter indicates when the system is up to speed and that the speed control is operating properly. When the motors are up to speed all operating stations receive a bullseye signal and the director starts the action. Red lights serve as a warning that recording actually is in progress and that quiet must be maintained on the stage.

Wiring arrangements of the recording system provide full flexibility so that any stage may be connected to any recording room, or amplifiers of one channel substituted for those of another. A dual set of storage batteries supplies filament and plate current to all amplifiers, recorder lights, and auxiliary equipment. A constant-potential system of charging is used.

Maintenance routines similar to those employed in large telephone repeater stations have been found expedient. In this way any potential trouble hazard in the electrical system is anticipated, since a failure during recording is very serious and expensive. Oscillators and suitable testing apparatus are included in the test laboratory equipment so that every channel may be tested daily before going into production.

Sound Picture Reproduction

The introduction of sound into the motion picture theater also has necessitated important changes. It has been necessary to redesign and rebuild projection booths to take care of the special sound-reproducing equipment. Towers have been built to support the horns behind the screen. In some instances theaters have been treated acoustically to improve reproduction. Speech, music, and incidental sounds must be reproduced with fidelity if the effect is to be realistic.

A typical installation layout for talking motion pictures consists of: (*1*) Film and disk reproducing attachments, by means of which small electric currents are generated with variations corresponding to the sound waves produced in recording, (*2*) vacuum tube amplifiers which greatly magnify these electric currents, and (*3*) sound projectors consisting of receivers and horns which convert this electric energy into sound.

Sound film is run through a standard projector modified by the addition of the sound reproducing attach-

Amplifier room showing power control panel and amplifier equipment for eight channels

ment. This is located between the head mechanism and the lower take-up magazine.

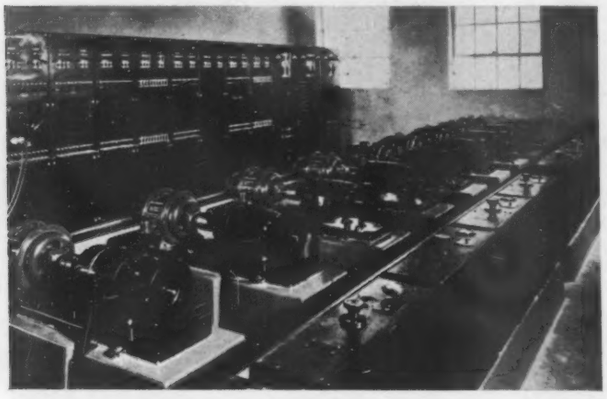
By means of an optical system, a light beam of high intensity is concentrated through a narrow slot and focused on a fine line across the sound track of the film which passes through the sound "gate." The film at this point moves at a uniform recording speed of 90 ft. per minute. On the film the sound record is made on a narrow strip along one margin.

Varied spacing of the light and dark bands along this track determines the pitch of the sound, while the varying density determines the quality and the loudness; i.e., the greater the contrast between light and dark bands, the louder the sound. On the other side of the sound gate and behind the film is a photo-electric cell which produces a small electric current the variations of which correspond to the variations of the modulated light which strikes it. The photo-electric cell output is strengthened by a small amplifier built into the sound attachment and then carried to a "fader" which is used to control the sound volume during the showing of the

film. From the fader the current is carried to an amplifier of a size and power suitable for the particular theater in question. From this amplifier the output passes through a distributor panel to the loud speakers and horns located behind the screen from which the sound issues in synchronism with the picture.

In the disk method of reproduction a current is generated by an electric reproducer playing on a disk record. The record is much larger than an ordinary phonograph record and revolves at 33 1/3 r.p.m., thus enabling each record to play throughout a whole reel. The small electric current from the reproducer is carried to the fader, where control is effected, and thence to the amplifier and loud speaker system as in the film method.

By using two projectors alternately, a continuous program can be run as with silent picture projection. This is accomplished by using the fader as a sound control at the same time that the changeover is made from one reel to the next. At the end of each disk or film record there is an overlap into the next, so that with proper operation the audience is unaware of any change being made. Unlike silent motion picture projection where the film generally is projected at a faster speed than it was photographed, the sound picture must be shown at exactly the same speed as that at which it was made, 90 ft. per minute. If a faster speed were used in reproduction the pitch would be changed, causing the voice or music to be distorted. A constant speed is maintained by means of a special type of motor and a vacuum-tube-controlled electrical governing system similar to the distributor-controlled system used in recording.



Motor distributor sets showing associated control cabinets and switchboard

Dependence of Sound Pictures on Other Electrical Engineering Developments

General processes involved in disk and film recording and reproduction have been discussed. From studio microphones to theater loud speakers the dependence of this new technique upon other electrical engineering developments has been heavy. Many kinds of apparatus developed for other purposes have been borrowed or adapted for use here, and many kinds of studies having other objects in view have aided the commercial application of sound to motion pictures. These include the condenser-type microphone or transmitter, the light valve, efficient amplifiers and high-quality loud speakers.

In addition to these types of apparatus, special incandescent lamps have been developed as light sources for the recording and reproducing systems, photo-electric cells have been employed in improved form, special motor systems have been used for synchronizing, regulated reproducer motors have combined vacuum-tube technique with special motor design, monitoring circuit arrangements have been adapted from communication systems, signaling circuits have been suited to sound recording needs, mixing apparatus has grown out of that used for combining the output of public address and radio broadcasing microphones, and electrical test sets of various kinds have been designed for special purposes.

Almost innumerable research and engineering studies carried on in the communication field have influenced the design of sound picture apparatus and the manner in which it is used. Special materials and new alloys developed through pure scientific research or for special purposes have been important items in the rapid development of recording and reproducing equipment.

It may be observed that one of the most important contributions in purely communication engineering, which led to the development of high-quality recording and reproducing systems, was in connection with laboratory studies undertaken to improve the quality of telephone speech transmission. For if in these tests the human element was to be eliminated, it could be done only by providing high-quality records of the desired sounds that might be used over and over again as sources of electrical currents to be analyzed. In such tests, likewise, the condenser-type transmitter and other high-quality transmission devices were necessary.

One of the accompanying sketches shows the various steps of recording and reproducing sound. It indicates the rather unusual transformation which takes place during the interval from the picking up of the original sounds to their reproduction in the theater. It is of considerable interest to trace these changes. Beginning as sound waves, mechanical motion is imparted to the diaphragm of the condenser transmitter. This mechanical motion in turn is translated into a minute electric current. After being amplified, the power of this current modulates a light to which film is exposed. The resultant latent image is treated chemically and, when developed, again modulates a light to produce the positive. After development, this positive, when run through a projector, modulates a beam of light, thereby controlling a minute electric current. After amplification the resultant power is sufficient to impart mechanical motion to a loud-speaker diaphragm, thereby producing a very close approximation to the original sound. Beginning as sound, fourteen successive changes of condition must be passed through before the sound finally is given to its audience. The same number of changes occur in disk recording.

General

The sound photoplay has revolutionized the work of the scenario writer, director, and actor, and has been instrumental in building up large musical departments in the motion picture studios. In the days of the silent

photoplay it often was the practice to schedule a feature almost before the story was written. During the actual photographing of the picture many thousands of feet of film were "shot" at random on large scenes in order to be sure that enough material would be available for the film cutters and editors to patch into a good story. Actors were closely directed so that the memorizing of lines was not important. With sound it has been necessary thoroughly to plan and rehearse each scene beforehand. Actors must memorize their lines and directors remain silent during the recording.

The director must broaden his artistic and dramatic efforts to include the new technical branch. Sound engineers with more electrical engineering experience than motion picture experience have found it necessary to adjust themselves to the new environment. These two different types of personalities have joined forces. To the motion picture producer nothing is impossible. The entertainment value of a photoplay depends upon novelty and creative ability; consequently each new picture reveals some limitation of the recording system which must be surmounted. The sound equipment must be adapted to every conceivable use. Due to the characteristic methods employed in motion picture production and the financial resources of the industry, the future development of sound pictures is certain to be swift and far reaching. In this development the electrical engineer is sure to have an important place.

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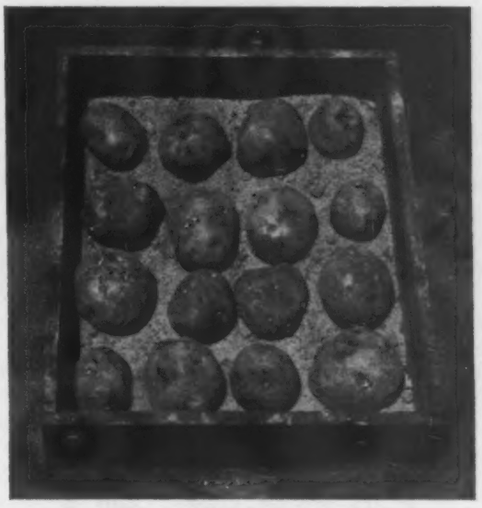
Electric Heat Hatches Insects *to* Combat Pests



Potatoes ready to be placed in hatchery for sprouting

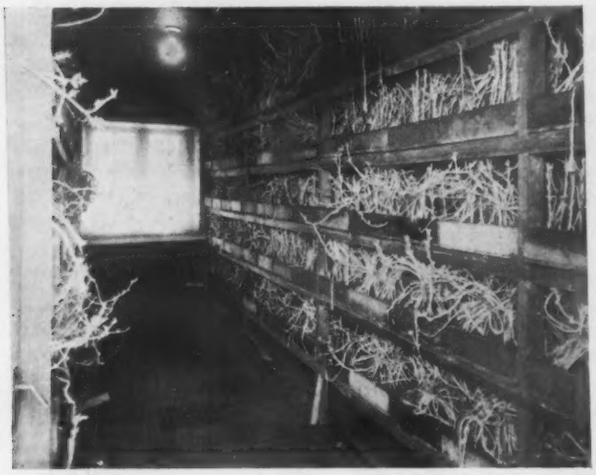
UNIFORMITY of temperature, accuracy of control, lack of fire hazard, reliability and facility for automatic control are features of electric heating that are responsible for its application to insectaries in southern California. Entomologists of the California State Department of Agriculture working in conjunction with electric heating engineers of the Southern California Edison Company have developed this new application.

Orchardists and raisers of all types of vegetables have long had difficulty with an insect known as a mealy bug. In some localities this bug has become a very serious menace. In attempting to devise some means of combating this insect threat, it was discovered that the small *cryptolaemus* (commonly known as the lady bug) dined almost exclusively on the mealy bug. With this as a basis for a start, a plan was decided upon to increase the number of lady bugs available for the agriculturist.

In the development of this program, carefully ventilated rooms were built, 18 ft. long by 8 ft. wide by 8 ft. high. In these rooms two tiers of racks are placed, and upon these racks are shallow trays, 15 in. square by 5 in. deep. It is customary to have about 150 of these racks to the room. Each one of these rooms has one window which is kept dark during the incubating season, but from which the curtain is lifted when the *cryptolaemi* begin to hatch.

It is essential that the temperature in these rooms be under absolutely accurate control. Several installations of this type of lady bug culture have been in operation in California using gas or oil as a heat medium, but for various reasons, not the least of which is the fire hazard, these types of fuel are giving way to electric heat. One of the outstanding causes for this change in sentiment toward the electric heating unit was the complete destruction by fire of the Downey Cryptolaemi Hatcheries which occurred in the spring of 1929.

The electric equipment used to heat one of these small rooms consists of eight heaters of ½-kw. capacity each. These heaters are all black heat industrial type. The large number of heaters makes possible absolute uniformity of temperature throughout every part of the room. The temperature is controlled with an automatic thermostat which permits a variation of less than two degrees. It is in this absolute control of the temperature that the electric equipment shows its superiority over any other possible form of heat.



Interior of insectary at Santa Paula, Calif., showing arrangement of trays and heating elements

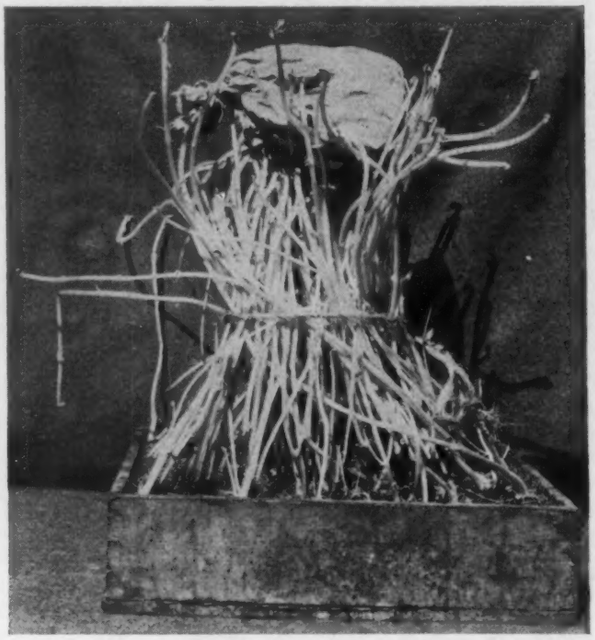
There are three distinct periods in the process of growing these bugs. The first one begins when the trays are filled with potatoes, twelve to sixteen potatoes being placed in each one of the trays. The potatoes are imbedded in a moist soil suitable to encourage sprouting. The room temperature is set at 70 deg. night and day for a period of three weeks. During this time the soil in the boxes is kept moist and the potatoes sprout profusely.

With a good crop of potato sprouts ready, the second stage in the process begins. This is known as the infesting stage. A few mealy bugs are freed in the warm room, and the temperature is raised to 80 deg., which temperature is then maintained for a period of two weeks. With the warm temperature, and plenty of potato sprouts for food, the mealy bugs multiply at an astonishingly rapid rate. At the end of two weeks practically the entire crop of potato sprouts has been devoured by the ever increasing horde of mealy bugs.

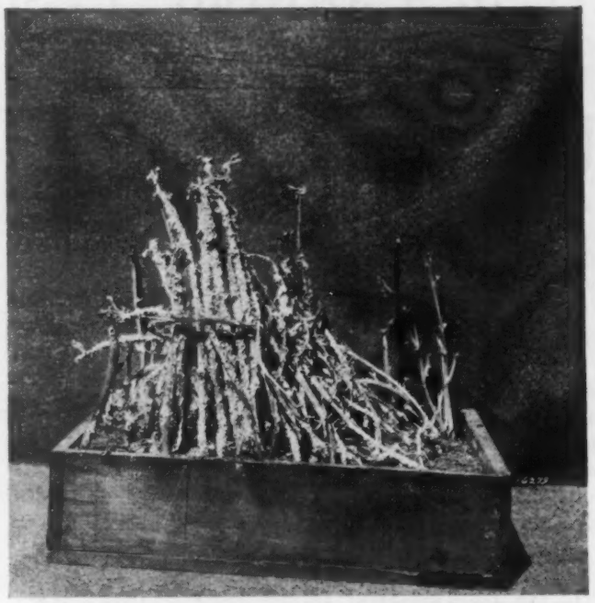
Then the third stage begins. A number of *cryptolaemi* are freed within the room, and for the next seven weeks the temperature is maintained at 75 deg. night and day. These few *cryptolaemi*, with the large quantities of mealy bugs ready to be eaten and the warm even temperature, proceed to multiply very rapidly. At the end of the seven weeks' period, the *cryptolaemi* are captured and placed in capsules, ten insects to each capsule. These capsules are then sent out to the agriculturists in the territory and the insects are let free in the orchards to combat the mealy bug menace.

From the electric point of view, each one of these warming rooms represents a 4-kw. load in operation for 24 hours a day for a full twelve weeks' period for each cycle of *cryptolaemus* development.

Each of these incubator rooms has a capacity of approximately 125,000 *cryptolaemi* per 12-week cycle. Fifteen county citrus associations and privately owned insectaries are now engaged on a commercial stage in the production of these lady bug *cryptolaemi*. Present estimates indicate that approximately 4 cents per insect is being spent on this work. About ten lady bugs per tree are let loose in the orchards.



Potato sprouts after two weeks' growth being infested with mealy bugs from small sack



Potato sprouts completely infested with mealy bugs at end of fourth week and ready for cryptolaemi

Thomas Edison and the president of the Tokyo Electric Light Company, Ltd., graced the windows of the company's branch stores during the Jubilee

ELECTRIFICATION IN THE ORIENT

By Clotilde Grunsky

EVIDENCES of Edison Day still lingered in Tokyo when the World Engineering Congress met there late in October. Mr. Edison's countenance, slightly orientalized but nevertheless recognizable, decorated every lamp-post in the main shopping district, flashing electric signs in unintelligible hieroglyphics surrounded signboard portraits of the "wizard of electricity," and a baseball game was announced in his honor!

This first impression of a progressive electrical industry persisted on further investigation. The statistics of Japanese power development are impressive. According to the Department of Communications, the estimated capacity of all generating stations at the close of 1927 was 5,384,290 kw., of which about two-thirds was water power development and about one-third steam. There are 1,626 power plants, 136,267 miles of transmission line, and 2,414 miles of electrified railways.

The majority of the business of supplying power is in the hands of five large companies, of which the largest is the Tokyo Electric Light Company, with a generating capacity of 877,650 kw. and 2,287,794 customers. The Daido, Toho, Ujigawa and Nippon companies cover between them most of the rest of Japan.

THREE movements now under way are of especial interest. One is the agitation for government regulation of rates and the division of territory to prevent overlapping and destructive competition. A committee was appointed early in 1927 which worked out a proposed basis for the establishment of governmental regulation of electric utilities, but opposition was aroused to some of the provisions of their plan, which was eventually defeated. Interest is still active in this movement, however, and in the meantime the larger power companies are endeavoring to get together to agree on a common basis for determining power rates for different classes of service.

Secondly, there is a widespread interconnection of power lines and interchange of power in the interest of economy and improved service. And thirdly, there is a growing tendency toward metered rates on lighting as well as power service, and toward a 24-hour service in all districts.

THE homes of Japan are said to be 92 per cent electrified, but lest this figure should move too many manufacturers to send shiploads of appliances for distribution in that country, it is well to explain that in a large number of these homes the electric installation consists solely of an electric light cord and a single light. This condition is in part due to the extreme poverty of Japan (85 per cent of its population have incomes of less than $500 per year per family of seven) and in part to the flat-rate system which bases the monthly charge upon the number of lights installed. The first result of this method of billing is to reduce the use of light to a minimum; the second is to encourage the 24-hour burning of whatever lamps there are. Meters are fast being installed, but it is informally estimated that 80 per cent of the homes served are still on the flat rate.

Japan's Red Seal emblem of adequate wiring

THERE is no lack of promotional activity being fostered by the electrical industry of Japan. In addition to organizations which correspond to the A.I.E.E., the N.E.L.A., and the Illuminating Engineering

Society, Japan has its Society for Electrical Development, its organization for the promotion of the use of electricity in agriculture, and its Electric Railway Association. Some thirty-five magazines are published in the electrical field, among them a purely electrical magazine for the housewife, with 6,000 paid subscribers. During the fall months an Electric Home exhibit, consisting of seventeen model bungalows of semi-western construction, was held in the vicinity of Tokyo, attracting an attendance of some 1,000 visitors per day during good weather. The Red Seal Plan, with a slightly modified requirement to fit in with Japanese construction methods, has been adopted, and is just now being introduced to the public and to electrical contractors alike.

"WHAT makes of radio do we carry?" The manager of the radio department of a large department store parried one question with another. "What kind of a set would you like? We will make it for you." With a somewhat loose patent situation in Japan, both local and foreign manufacturers have suffered from the competition of the small shop. In particular, it is difficult for the manufacturer of expensive equipment to find a market. American goods are liked, however, and are looked upon as representing the highest in quality. Among the class who can afford to pay for good materials there is a genuine market for equipment bearing American trade-marks.

DEMONSTRATIONS and exhibits of electrical equipment are common and are well attended. The Tokyo Electric Company has an impressive display of home and industrial lighting at its factory at Kawasaki, with a model Japanese home in which afternoon tea is served to select groups of housewives before whom all varieties of electrical equipment are later demonstrated. The Electrical Department of Kobe has offices for the display and demonstration of electric appliances in the main shopping district. Demonstration programs staged by the larger department stores are not uncommon.

In general, the manufacturers take the most important part in the distribution of electric appliances. The power companies are as yet not very active in the picture, but they are beginning to recognize the importance of their domestic load, and delegations have been sent to the United States to make a study of merchandising methods. Dealers in both the electrical and radio fields are legion and are varyingly successful. Very little is known in Japan about field selling or American methods of campaign merchandising—the Japanese with his Oriental ideas of the legitimacy of bargaining, is a good salesman within his four walls, but usually he waits for the public to come in to buy.

LAMPS, electric fans, irons, flashlights, tea kettles, grills, heaters—this is about the usual order of popularity of electric appliances in Oriental countries. In Japan, radio is ranked third in popularity. The larger appliances find few purchasers because of their high initial cost, as well as the fact that they do not always fit into the conditions of Oriental housekeeping.

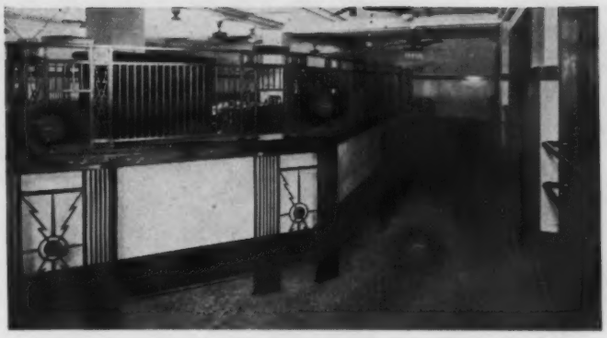
An up-to-date merchandising store is the electrical store of the Pacific Commercial Company, Manila, P. I.

THE Chinese ideograph for electric light conveys the idea of "foreign light," but the Chinese have adopted it eagerly for their own. Wherever electricity is available, the business district will be found to be a blaze of light at night, with buildings outlined and streets festooned much after the fashion of a World's Fair. This interest in electric lights has led to the establishment of power plants far inland, some of them at distances which mean a week or more of overland travel after the last water transportation or railroad line has been left behind.

Chinese operated power plants, however, suffer under certain difficulties. There is a tendency for the owner to regard all income as profit and to neglect proper provisions for upkeep or subsequent replacement of equipment, so that a plant once out of order is apt to limp along on crippled service. Far too heavy loads are allowed on the lines, with the result that voltage fluctuates between wide limits. Neither appliances nor power loads are possible on most of these interior plants, which operate only at night to supply a lighting service.

Exceptions to this rule must be made for all places where Western influence predominates, as for instance, at the treaty ports—also for one or two of the more advanced industrial centers such as Canton and Hangchow. Here there are efficiently operated power systems, growing loads of motorized industry, and homes using the simpler of the electric appliances.

THE Shanghai Power Company, recently purchased by American capital, has for some time been carrying out what they call a "hire plan" for renting electric ranges, water heaters, air heaters and motors. The rental charge for a 9-kw. range is about 50 cents (gold) per month, or 25 cents if the householder does his own wiring. (The power company wires the home up to 60 ft. free of charge.) A 2-kw. water heater of the storage type rents for about $1 per month, while a 3-kw. air heater comes to only $1 per year. Originally these, too, were rented on a monthly basis, but it was found that the cost of calling for the heaters and replacing them with every change of weather was so great that it was cheaper to quote a lower yearly rate. Motors run somewhat higher, charges varying from about $1.50 per month



Chinese decoration of grilles in the American owned Shanghai Power Company offices brings old and new worlds together

for a 1-hp. motor to $25 for a 200-hp. motor. Included in all these charges is complete servicing on the part of the company. Electric rates for domestic power are reasonable, amounting to about 1½ cents per kw.-hr. for this service. It is figured by the power company that the use of an electric range increases the customer's bill by from $3.50 to $4 (gold) per month.

The initial cost of wiring, and later of servicing is, of course, low, on account of the cheap labor available. At the present time the company reports a load of 36,000 kw. in heaters, 6,000 kw. in ranges and 28,000 hp. in motors.

IN CONNECTION with its range rental service, the Shanghai Power Company employs a male demonstrator to instruct Chinese cooks in the operation of the new equipment. This personage has to be an artist in tact, as well as an expert in electric cooking, for no Chinese kitchen potentate is likely to permit any infringement of his own province, and an insinuation that he does not already know all there is to be known about cooking is regarded as a loss of "face." It is a tribute to the demonstrator that only once or twice has he been chased off the premises.

THE power companies of Hong Kong and Tientsin merchandise direct from attractive central show rooms. Here, as in Shanghai, the foreigners are looked upon as the first purchasers of electric equipment, but for the bulk of their business the companies must interest the Chinese.

THERE is an increasing competition everywhere in the Orient from local manufacturers who take advantage of cheap labor and materials to put out a salable, if generally inferior, product. Some of this competition is legitimate, but occasionally other methods are utilized. American manufacturers are familiar with the necessity for eternal vigilance to prevent their trademarks from being infringed. Sometimes duplicate labels are simply pasted upon foreign made goods; sometimes the most ingenious evasions are employed to accomplish the same effect. One Chinese manufacturer adopted the purely fictitious name of "The U. S. Anderson Company," for instance, in order to be able to write at the bottom of his package "Made by U.S.A."

THE importance of radio as a means of communication was first discovered by the military forces of China, and as a consequence receiving sets were for a long time classified as munitions of war and entirely banned from import. Later the possibilities of broadcasting as a means of influencing public opinion was recognized, the chief trouble in that regard being, however, that there are numerous generals in authority, no one of whom is quite ready to trust another with this important means of spreading propaganda. At present there is a very real interest in radio in China, but very little broadcasting worthy of the name, and great difficulty in the importation of equipment. There is undoubtedly a future for radio here, but this will have to wait, like so many things, for the slow process of disentagling the political and economic situation.

FOR all his American schooling and political affiliations, the Filipino has many ties with both the Orient and Spain. Here, as in China, the electrical industry is confronted with the problem of selling to a small white population, most of whom are temporary and do not care to make any large or permanent investment in electrical equipment, and to a large native group, the lager proportion of whom have incomes below the poverty line. Even the poorer class Filipino likes Western progress, however, and when he can, he buys an electric refrigerator for his parlor and an electric radio for the benefit of his neighbors.

THE Meralco Power Company, serving Manila and its surrounding territory, now has a 30,000-hp. hydroelectric project under way at Botocan Falls, which is to be completed by the end of 1930. With this power available, the company is seeking new markets in both industrial and domestic fields. The first electric range campaign ever conducted in Manila has just been completed, the power company, manufacturer, and leading electric dealer combining to sell 100 ranges during the months of February and March. Further promotional work in the domestic appliance field is contemplated.

SOME of the difficulties confronting those who sell electric appliances in the Philippines are explained as follows:

Vacuum Cleaners—The houses have no rugs or carpets of any kind.

Washing Machines—Taking in washing is the chief industry of the feminine portion of the population and the good old method of pounding the clothing on a rock is still universal.

Percolators—Boiled coffee is preferred to percolated.

Toasters—Toast is regarded as a diet exclusively for invalids.

Ranges—Tropical climate and Oriental servants unite to keep the housewife out of the kitchen.

Refrigerators—Purchasing is usually for the day only and the habit of storing food is one which still is to be acquired.

For all this, electrical appliances are being sold and the market is gradually increasing as the level of prosperity rises.

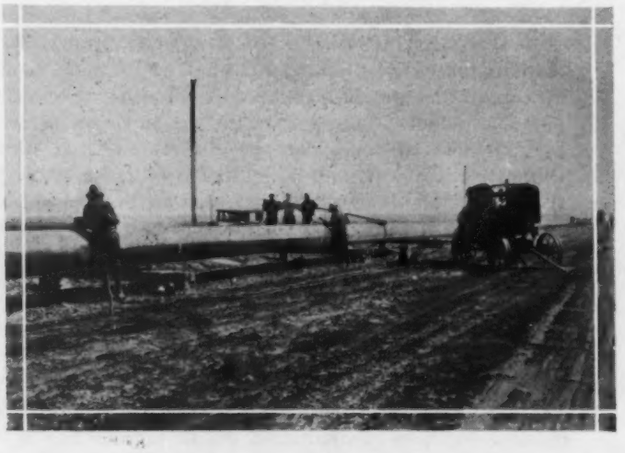
"Rolling welder" completes 20 joints a day

ELECTRIC WELDING

WITH THE AID of portable electric welding equipment a record-size 26-in. natural gas pipe line has been welded and laid this spring in the San Joaquin Valley (Calif.). With their operations carefully synchronized, two 175-man construction crews, working from portable camps placed about 40 miles apart, each completed about one mile of line a day. The 200-mile line has a present gas transmission capacity of 138,000,000 cu.ft. per day and supplements the initial 20-in. line which was completed in 1929 to bring Kettleman Hills gas to the San Francisco Bay region. The new line, which is jointly owned by the Pacific Gas and Electric Company and the Standard Oil Company of Cali-

Assembling 10-length sections by tack-welding

"Rolling welder" on one joint, helper cleaning next, three men turning



Placing sleeve for double-bell joint

Welding around pipe when joining long sections

MILE-A-DAY record established in the construction of a 200-mile, 26-inch pipe line.

for

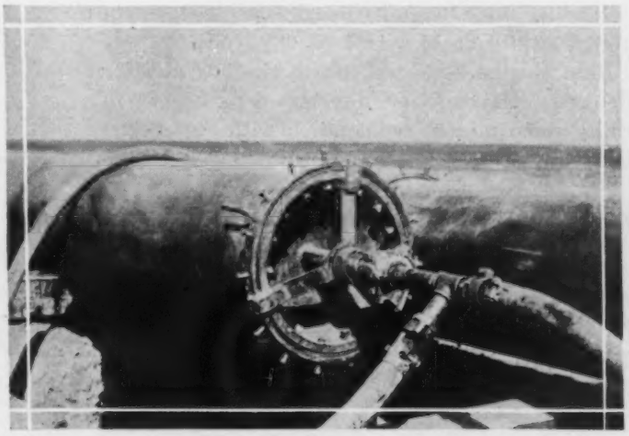
NATURAL GAS

Joining two one-mile welded lengths

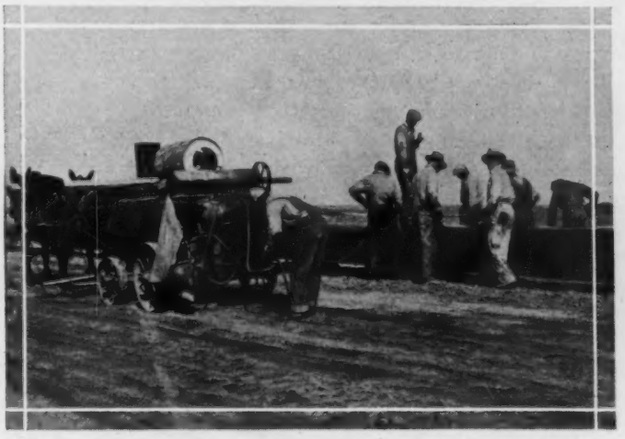
fornia, upon its completion will make natural gas available (through branch lines) to Sacramento, Stockton and many other north-central California communities.

In each of the crews there were eleven welders, twelve generator sets, one maintenance man, and a foreman. The speed and efficiency of these welding crews were important factors in achieving the rapid rate of daily progress. Working at rolling welding, members of these crews made twenty welds per day, while with acetylene no more than three such welds could be made in a corresponding time, as was demonstrated by construction experience on an earlier line.

Testing mile-lengths for leaks—strength not questioned



Completed pipe is flexible and easily lowered into trench



Painting completed section with portable painting outfit

Expansion joints are used to turn through small angles

Electrical West

G. C. TENNEY, *Editor*

Mergers and Public Relations

WITH the purchase of control of the Great Western Power Company and the San Joaquin Light & Power Corporation by the Pacific Gas and Electric Company, the national movement toward mergers and consolidations is brought home directly and forcefully to the industry here on the Pacific Coast. Hitherto the industry has viewed this trend with a more or less casual interest, chiefly because it did not affect any of the Western power companies.

The present merger, however, affects a large section of this territory. It draws attention for the first time to the arguments in favor of such consolidations. Centralized management, elimination of duplication, savings in operating costs, cutting out of competition, consolidation of power resources and serving facilities will result in economies and improvement in service that will benefit the consumer to a large extent.

The merger also draws attention to a growing suspicion on the part of the public toward consolidations, particularly where large properties and a vital service such as electricity supply are concerned. There are indications of a definite shifting of public opinion back to the "trust-busting" days of Roosevelt.

Thus this present merger does not so much become a problem of engineering, financing, or operating, but of public relations. The industry has demonstrated its ability to meet the physical problems that come with any merger. Public relations however is a different matter. If any warning could be issued regarding the consolidation of the companies serving northern and central California, it would be for every employee to redouble his efforts to sell the *benefits* of the merger to the public.

To and Including the Switch and Meter

ALL controversies involving the "high cost of wiring" for ranges and other heavy-duty domestic appliances run squarely up against the fact that the biggest item of cost in the installation is in the new entrance pipe and larger main service switch required. If the service pipe is large enough to accommodate the wires to supply a range load, and if the larger service switch is already installed, other costs are relatively small.

Might not investigations be conducted, then, to determine whether the new service entrance and main switch should not become a part of the utility's responsibility in serving a customer who wants to increase his load? If range and water heater load are desirable—and there is no doubt on this point—might not the problem of wiring be simplified if the serving company furnished the larger entrance facilities required?

There are numerous aspects of this situation to be taken into consideration, of course. The delicate question as to how far into a building the power company can install equipment is perhaps the most serious to be decided. And it should be decided with the complete understanding of all parties apt to be affected.

Yet the practice is not without precedent. Some Eastern companies do assume responsibility up to and including the meter. Other utilities, such as gas and water, usually do the same. When a customer adds equipment requiring more gas or water, the serving company automatically increases its service facilities to accommodate him. Cannot the electric utility do likewise?

Here is a question well worth the investigation of commercial and engineering departments of utility companies in co-operation with contractors and city inspection officials.

Inspiration as a Driving Motive

CONCERTED action is seldom possible without organization. And organization without inspiration is mere framework, pretty to look upon, perhaps, but without direction or movement.

All large organizations, therefore, make good use of the power of inspiration. It is a remarkable feature of their programs. No sales plan is started without meetings or conventions in which to concentrate attention on the objectives sought.

It is in this single feature of sales work today that the individual dealer or contractor is most limited. He must be his own inspirer and organizer. If he fails to keep himself up to the proper pitch to meet the needs of the undertaking he fails as a merchant in competition with these highly organized and inspired sales drives.

Yet, he can receive from his trade association the same type of direction, the same inspiration to strive for achievement, if he will demand this of his organization. But the individual dealer and

contractor must realize this need and demand its fulfillment.

Concerted action is effective on a wide front. The business fate of the individual in this day of mergers and chains lies in the individual inspiration he can bring to his own job first, and, more important, to the drive which he, as a member of an association, may direct toward common sales objectives.

Commercial Aspects of Adequacy in the Code

CODE making and code revision present some of the most complicated problems confronting the electrical industry, principally because of the multitude of differences between the various interests involved that have to be composed. Probably the most controversial question in code making at the present time is, How far shall the code go toward setting up minimum requirements with the idea of insuring adequacy? L. W. Going, chief electrical inspector, Portland, contends that the National Electrical Code should contain adequacy requirements in its provisions for branch circuits similar to those for feeders.

Those holding opposite viewpoints with respect to adequacy in the code question the legality of adequacy requirements; they maintain that securing adequate wiring is wholly a commercial function. Perhaps they are right, although Mr. Going holds that adequacy requirements have a distinct bearing on safety. No doubt such requirements have their commercial aspects, and it is in this phase of the subject that the principal differences of opinion are found, since it is true that commercial problems vary greatly in different sections of the country.

Here in the West, generally speaking, power companies have recognized the necessity of intensive development in the domestic field and have made promotional rates to attract this business. Wider than average domestic use has resulted. On the other hand, it is recognized that in other parts of the country the commercial problem is entirely different, and actually becomes in some sections and among certain classes of prospects, a proposition of getting wiring costs down so that the prospect will install a few drop lights rather than use some other form of illumination.

Thus do we find adequacy requirements working *for* the one condition and *against* the other. As a result of the prevalent practice among architects and builders to treat the code as a set of specifications, we find commercial departments of companies which are actively promoting a wide use of electricity in the home, thwarted in their efforts to get equipment used because of the lack of outlets through which to use it. Yet, if more wiring is to be demanded by the code, other commercial departments with other problems will be harassed by the sales resistance created by the greater wiring expense involved. Thus might a code that would open the way to one type of commercial development, hamper and restrict another type of development. Since these conditions exist in different sections of the country, it is not likely that a solution of this particular code problem satisfactory to everyone will soon be found.

Until the code does provide adequacy, wiring that will permit complete electrification must be sold. Commercial manager, power salesman, contractor-dealer and appliance salesman are the ones charged with the selling.

Greater Use Encourages Good Public Relations

ONE school of public relations theorists has always held that if the customer can be persuaded to increase greatly his use of electricity, then his increased satisfaction will be a guarantee of good public relations. This theory is based upon the supposition that the public will deal reasonably and fairly with an agency that brings comfort and convenience at an equitable price.

So far this has remained theory. It has fallen to the Pacific Power & Light Company to demonstrate the theory in action, thus making fact of it. In one city on its system, where residences consume an average of 1,900 kw.-hr. per year, the people are a happy lot who regard the power company with satisfaction and pride. In another city, whose population uses an average of 390 kw.-hr. per residence per year, public relations suffers from complaints and discontent.

To the company the first city, with its satisfied customers, also proves better as a source of revenue. Net returns are higher. And yet the customers enjoy the lowest rate, averaging two cents per kilowatt-hour. It can be said truly that all parties prosper in this city.

In the second city, although the average rate paid on the small consumption is eight cents per kilowatt-hour the company earns less net, and nobody is satisfied.

If this is not concrete evidence in support of the theory that "use equals happiness," then better proof of any theory will be hard to find.

Engineering Practice

Straightening a 15-Ton Shaft Without Shop Facilities

Field Methods and Equipment Effectively Reduce a 0.021-In. Curvature in a 35-Ft. Vertical Generator Shaft

By G. E. DECKER, Master Mechanic, Southern California Edison Company, Los Angeles, *and* C. G. HECKMAN, Asst. Supt., Big Creek Division, Southern California Edison Company

ONE OF THE MOST DIFFICULT field maintenance jobs met with in several years was the straightening of a 35-ft. shaft 21⅜ in. in diameter in the rotor and tapering by steps to 18 in. at one end and 10 in. at the other. The problem arose when a 28,000-kva. vertical unit at Big Creek No. 3 hydro-electric generating plant of the Southern California Edison Company developed a vibration which required its removal from service. It was not thought practical to remove the rotor, which was made up of steel plates 2½ in. thick and shrunk on individually. Therefore, it was decided to do the job with the rotor in place on the shaft.

When the unit was dismantled and the rotor laid in a horizontal position and rotated in temporary bearings it was found that there was a 0.021-in. bend in the shaft approximately at its middle point. This deflection represented the deviation as it would be measured from a straight line connecting the centers of each end of the shaft.

Measurements quoted in this article, however, are those obtained by rotating the shaft in the temporary bearings and therefore indicate the total movement occurring at the place of measurement during one revolution. By this method the gage at the upper end of the shaft (the left-hand end in the sketch) gave a reading of 0.027 in. and the gage at the lower end a reading of 0.050 in. At the same time a gage reading obtained at the center of the rotor showed a deflection of 0.007 in. in the opposite direction. Plotting these data to obtain a graphical representation resulted in curve "A" in the accompanying sketch.

Temporary equipment was set up on the power house floor and, after successive applications of heat, the shaft was straightened to within 0.0015 in. of a straight line. This minute deflection in a 35-ft. shaft was considered negligible from a practical standpoint and the unit was put back in service.

Just how the bend occurred in the shaft is not accurately known, but it is known that the car on which the shaft and rotor came from the factory was wrecked in transit. It is quite possible that this car rode the ties or may have had even rougher treatment. There had always been considerable vibration in the machine and after several years of service this vibration became serious in spite of some major changes made in the waterwheel equipment and some repairs made to field coils. Load and water conditions were such that it was necessary to continue the unit in service for several months after it would otherwise have been shut down for the overhauling. During this time several attempts were made to reduce the vibration by the usual counterbalancing methods, but without much success.

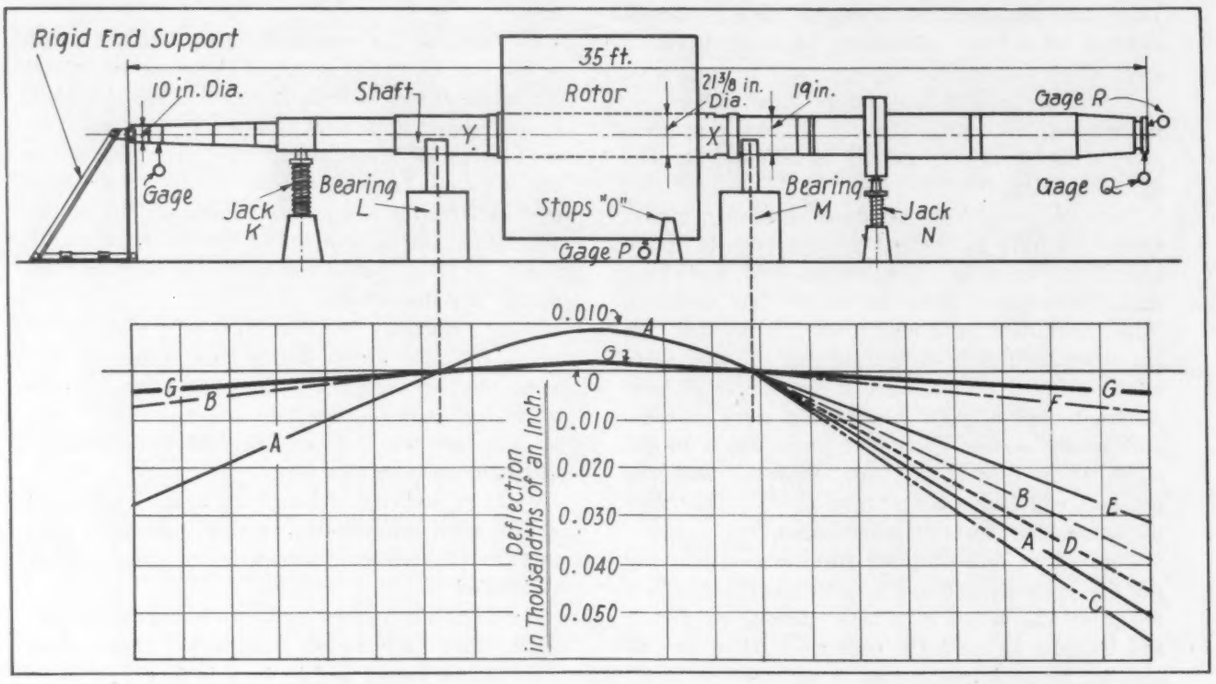


Diagram showing arrangement of equipment and curves showing corrective results of successive applications of heat to deformed shaft

In the accompanying illustration, which shows a general view of the repair set-up, the rotor may be seen in place on the temporary bearings. These bearings were mounted on concrete blocks poured for them directly on the power house floor. It was realized that to obtain the necessarily accurate and consistent readings a firm foundation was required, particularly in view of the 120-ton weight of the rotor assembly to be handled.

A driving belt, which may be seen around the rotor, also passes around the drum of a variable-speed, motor-driven, portable hoist which was used to rotate the shaft when the surface gage readings were being taken. Several of the eight Starrett dial-type micrometer gages used in various positions may be noted in the accompanying illustration. These were mounted on rigid angle-iron frames, conveniently placed and bolted to the floor.

To confine the heat to the desired shaft area a rough box of asbestos sheets was formed around the shaft where the bend was desired. This box was left open at each side of the shaft to permit the flame of a large kerosene pressure burner to be applied directly to the shaft on each side. With this arrangement there was complete control of the heat. By varying the flame of either burner, and by raising or lowering the flames, the possible distortion of the shaft due to heat strains was kept under full control.

Heat was applied first at "Y" on the shaft and resulted in a correction, as shown by curve "B" (see diagram). All subsequent heats were made at "X."

The method used was based upon the known fact that a horizontal shaft will almost invariably receive a permanent bend if allowed to come to rest and cool in a "hot box" bearing that has become sufficiently hot to melt the babbitt. With this accidental condition in mind the situation was reversed for the purposes of this repair job. The shaft was placed in a horizontal position with the high spot of the bend "up" between two rigid supports. Then heat was applied at the point where it was desired to bend the shaft. The maximum temperature used was that sufficient to melt babbitt or a little more, and ranged from 600 to 800 deg. F.

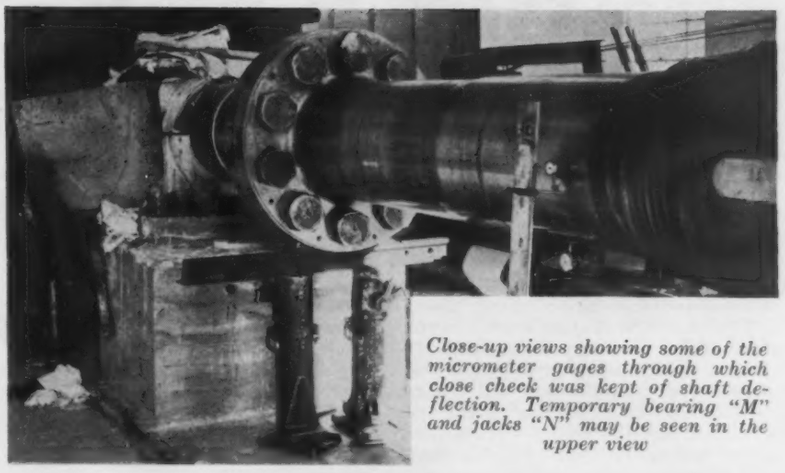
In all, some twelve successive heats were made. However, some of them were lost or had negative results because of a lack of definite knowledge of many of the variable factors to be contended with, or how best to control or counteract these undesirable effects. As these unknown factors were encountered they were analyzed and compensated for, but they were most aggravating when encountered.

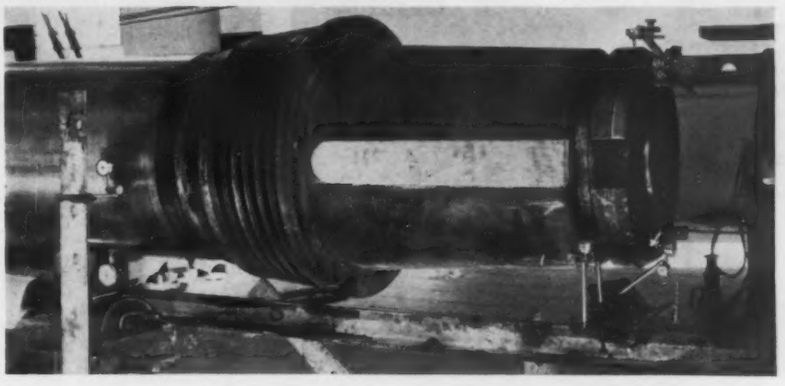
It is believed, however, that another job of this kind would be comparatively simple and that it would be possible to show a definite improvement for each successive heat, and it is for the purpose of passing along the practical experience obtained from this particular job that the details are set forth rather fully in this article.

A typical operation for a single "heat" at point "X" (see diagram) will suffice as an explanatory guide because all heats were made on the same principle. The shaft was rotated at about 15 r.p.m. and gage readings were taken on the under side of the shaft. The position of the high spot and the amount of its deflection in thousandths of an inch were marked on the shaft. Then the shaft was brought to rest in such a position that the bow of deflection was up at the middle and down at the ends. With jack "K" removed, jack "N" was raised until the shaft had a clearance of about a quarter of an inch in bearing "M." With the entire weight thus carried by bearing "L" and jack "N," bearing "L" acted as a fulcrum about which the mass of the rotor would tend to rotate if the shaft were softened at "X."

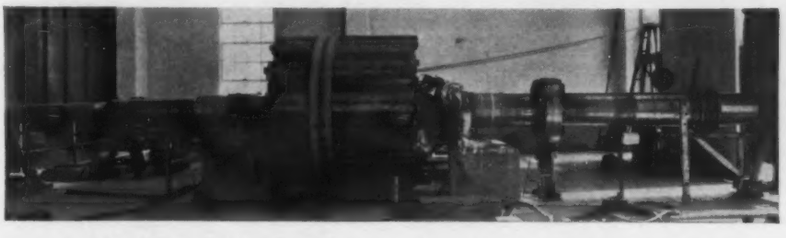
Stop-blocks "O" then were put in place under each side of the rotor and jack "N" was lowered to allow the entire weight to rest on bearing "L" and stop-blocks "O." With the shaft in this position all gages were set to zero reading. Then jack "N" was operated to raise the shaft a definite predetermined amount. On this job the amount raised, as indicated on the gage under the rotor at "P," ranged from 0.006 in. to 0.012 in., and the gage under the end of the shaft at "Q" read from 0.090 in. to 0.110 in. Particular care was taken to see that the side gages still read zero after the shaft was raised.

Heat then was applied at "X" and





Close-up views showing some of the micrometer gages through which close check was kept of shaft deflection. Temporary bearing "M" and jacks "N" may be seen in the upper view



A general view which corresponds to the diagram on the facing page

controlled as necessary to hold all gages at the initial readings at which they were set. The heating was continued for from 60 to 90 min. When a temperature of about 700 deg. F. was obtained a very noticeable movement of the shaft took place and the heat application immediately stopped. Natural cooling then was allowed to take place until the next day, at which time stop-blocks "O" were removed and the shaft was lowered into bearing "M." Then by rotating the shaft the amount of correction was noted from gage indications at the various points. On the basis of results obtained, plans for the next heat application were made and the process was repeated.

In the accompanying diagram the various curves, A, B, C, D, E, F, and G are given. These curves, in the order named, are the results of the successive heats. It may be noted that curve "C" shows a decided negative result as compared with curve "B." This occurred because sufficient attention was not given to watching and preventing heat-stress deflection while focusing attention upon the desired corrective binding motion. Thus, while a correction was made in the desired plane, another deflection occurred in another plane. The technique, however, was improved so that the last five curves, shown by C, D, E, F, and G, were as expected and the movement of the shaft was under perfect control. It is of some interest to note in passing that the successive readings obtained from gage "R" at the end of the shaft, giving an indication of longitudinal expansion of the shaft, also gave an accurate indication of comparative temperatures. This gage really indicated the attainment of desired internal temperatures more accurately than the thermometer mounted against the shaft immediately adjacent to the point of heat application.

It is believed that almost any shaft could be straightened by the described method at a much lower temperature than has been generally supposed to be necessary. It is also believed that the necessity for turning down with a lathe tool may be obviated in practically all cases. The cost is only a small fraction of any other common method.

For several months the repaired unit has been back in service and gives every evidence of continued satisfactory and quiet operation.

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Steam Power Engineering Makes Progress

STEADY development during the past fifteen years has made possible a reduction of 40 per cent in the fuel consumption per kw.-hr. generated in the country's steam-electric stations. Reductions in excess of 50 per cent have been realized through the use of the mercury-vapor process. Many significant development objectives have been reached, some surpassed, and many yet challenge engineering talent and executive foresight.

Among the major objectives actually attained, according to the Power Division of the American Society of Mechanical Engineers, are the following:

1. The types of fuel preparation and burning equipment which are available permit the efficient burning of coal varying in grade from lignite to anthracite.

2. Fuel-preparation and burning equipment is available which is sufficiently flexible so that coal of widely varying grades may be burned in connection with a single installation.

3. Fuel-burning equipment, boilers, and boiler accessories are available which permit the generation in a single boiler unit of the steam required for a 75,000-kw. turbine.

4. Single-cylinder turbines of 75,000-kw. capacity, tandem-compound turbines of 160,000-kw. capacity, and cross-compound turbines of from 200,000-kw. to 300,000-kw. capacity are available.

5. Equipment is available for operation at steam pressures up to 1,400 lb. per sq.in. gage and steam temperatures up to 750 deg. F. (There is considerable evidence to indicate satisfactory operation at even higher temperatures.)

6. Equipment is available for the reheating of steam withdrawn from the lower stages of the turbine, using either the heat from flue gases or the latent heat from high-pressure steam.

7. There is available equipment for heating feedwater by means of the regenerative cycle, using from three to five stages of heating.

8. Furnace water-wall construction is available, which eliminates to a great extent the use of refractories in the portions of the furnace walls which are subjected to the highest temperatures.

9. Condensing equipment is available which will maintain high vacuum with low investment and operating costs.

10. Economizers and air heaters are available by means of which the losses in the flue gases are reduced to very low values; and the investment and maintenance incident to the use of this equipment are reasonable.

11. There is available commercial equipment for operation on the mercury-vapor-steam cycle, each unit in the boiler house being capable of developing up to 20,000 kw.

12. There is available combustion-control equipment which will maintain day in and day out in the boiler house, operating efficiencies closely approximating test efficiencies.

13. For the average power station it has been possible to reduce the make-up water to approximately 1 per cent, which may be easily evaporated with an inappreciable loss due to the degrading of heat. For boiler plants requiring a high percentage of make-up, equipment is available which makes it possible to maintain conditions of operation and a degree of reliability and availability of boiler units closely approximating that for boilers operating on distilled water.

14. The coal and ash handling equipment now available make very low labor costs obtainable.

It is possible, assuming favorable conditions, to produce power by using the straight steam cycle with 12,500 B.t.u. per kw.-hr. of net send-out, and, assuming the same favorable conditions, to produce power with from 11,000 to 10,000 B.t.u. per kw.-hr. of net send-out by using the mercury-vapor-steam cycle of generation.

We have available today all of the equipment and the knowledge required for the assembly of this equipment and for its operation to permit us to build highly efficient generating stations, varying in size from the super-power station of 1,000,000-kw. capacity to the industrial plant of 1,000-kw. capacity.

Problems Suggested for Study

Possibilities of future revelations of research and experience are of interest to speculate upon. However, far more profitable in the actual reduction of operating and production costs will be a concentration of study of ways and means of utilizing to its utmost the knowledge and equipment now available. Specific problems suggested for particular study of design and operating engineers are:

1. Reliability. Higher equipment availability factor to be made possible through design refinements, careful selection of auxiliary equipment, division of auxiliaries into smaller unit groups, careful piping design, continuous and adequate inspections and thoughtful scheduling of required maintenance work.

2. Investment. Reduction of capital investment and resulting fixed charges.

3. Reserve capacity and station extensions. A more careful balance between required and reserve capacity.

4. Size of units and stations. Careful study and thoughtful foresight required, again to gain maximum financial economies.

5. Equipment interchangeability. Standardization within a given station and among the different stations of a given system will permit appreciable reduction in investment through reduced development and manufacturing costs.

6. Simplification and ease of operation. Much remains to be done in simplifying operation through uniformity of design throughout a given station and elimination of non-essential details. The selection and education of manpower also are of vital importance.

Unit Substation Design Economies Proved Out by Experience With Rural Stations

By FRANCIS CURTIS, Engineering Department, The Southern Sierras Power Company, Riverside, California

ADVANTAGES of the standardized unit-type substation design are emphasized by the operating experience of The Southern Sierras Power Company. Particular reference is made to that company's Perris substation which is the switching center of a small 33-kv. network which serves lighting, industrial and heavy pumping loads in and around the communities of Riverside, Hemet, Elsinore and Corona, in Riverside County, Calif. Satisfactory electric service in this area demands a flexible switching arrangement at the substation together with the necessary protective equipment and other incidentals, whereas economics demanded that this be accomplished within the limits of an expenditure warranted by load conditions. Cost records covering the initial rebuilding job at Perris substation, at which time the unit-type outdoor steel switching structure was started, show a unit cost of about $5,000 per circuit including everything chargeable to the job.

Now the unit structure has been enlarged from the three-bay structure described in the Aug. 1, 1928, issue of ELECTRICAL WEST (p. 85) to a seven-bay structure accommodating five 33-kv. line sections, one transformer bay and one spare bay. Here again engineering and economics have been combined advantageously, resulting in construction costs of about $4,000 per circuit position, including everything.

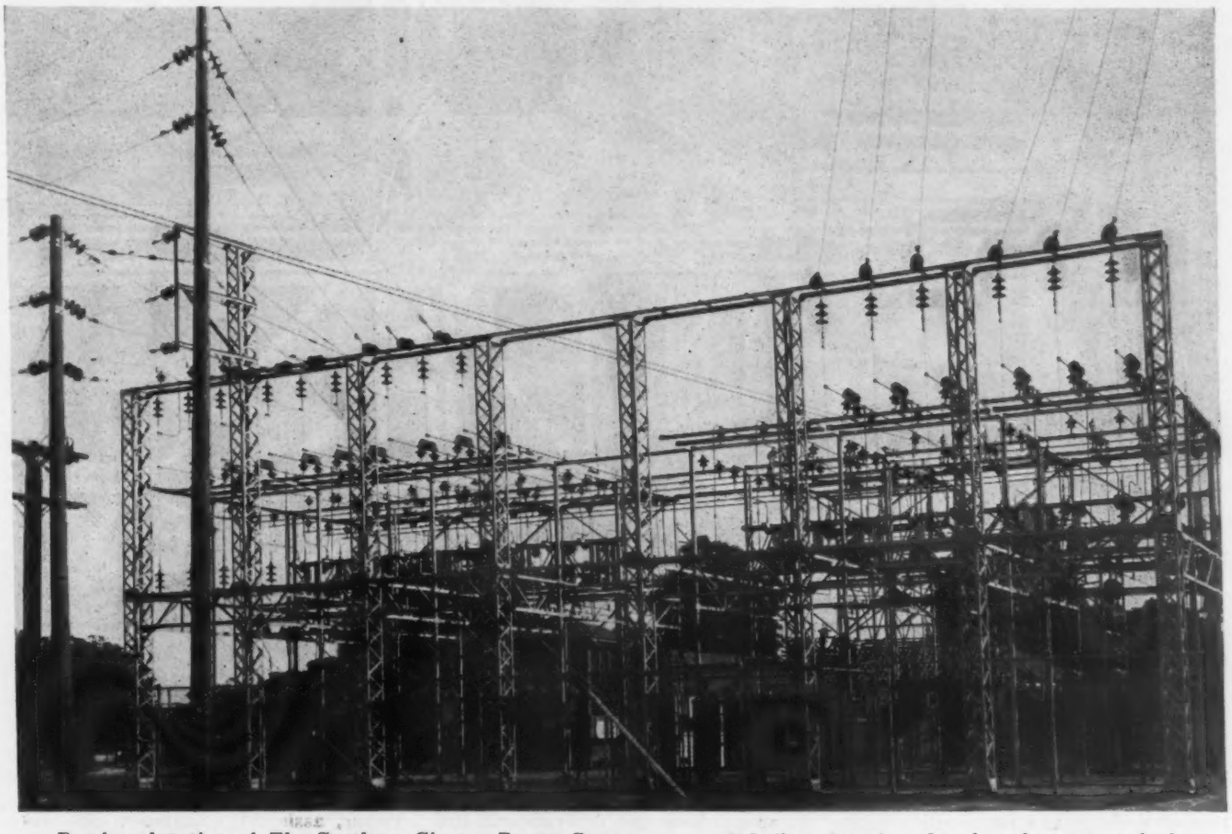
The substation design scheme employed is that of the double bus system utilizing one oil circuit breaker and two group-operated bus selector air-break switches per circuit. This arrangement provides the facilities through which the oil circuit breaker and its related equipment may be removed from service for inspection or repair without service interruption. Due to the fact that the station is fed through two different 33-kv. lines from the company's main transmission center in San Bernardino, it was considered unnecessary to install the extra oil circuit breakers necessary to complete a full normal double-bus layout. The bypass switches are of such character and so placed that they may be used safely to interrupt the load current over any of the 33-kv. line as required.

The bus structure itself is made up of fabricated galvanized angle iron. As may be noted in the accompanying illustration, the 33-kv. lines are dead-ended on an angle-iron beam at the top of the square latticed columns. Each bay is 12 x 31 ft. in plan and 25 ft. high. Induction over-current relays are provided for protection of all 33-kv. positions.

The old original substation, together with the temporary tie used during the two years between initial and final reconstruction, was replaced by the new construction. A new 1,200-kva., 33/2.3-kv. transformer bank has replaced the older 900-kva. bank. When the new bank went into service provisions were made for a future oil circuit breaker to replace the tetrachloride fuses now protecting the 33-kv. side. The new structure also provides space for three outgoing 2.3-kv. circuits and one totalizing position.

An individual feeder switch house, containing indoor oil circuit breakers and metering equipment, serves each of the 2.3-kv. circuits. Both main and transfer buses are included in the 2.3-kv. switching stucture, affording the advantages of repair and inspection of equipment without interruption to service.

One of the 2.3-kv. circuits serves the local lighting load of the city of Perris and this circuit is equipped with two induction voltage regulators. These are



Perris substation of The Southern Sierras Power Company, a unit-built substation that has demonstrated the efficacy of the simplified unit design and construction program

of the latest design outdoor type, 24-kva. capacity, providing a 10 per cent boost or buck. They are self-contained units with control equipment mounted within weatherproof steel cabinets attached directly to the regulators. Roof bushings are provided in the upper regulator cabinet to carry the 2.3-kv. leads through, but owing to the low elevation of live parts of these bushings the company has adopted the standard practice of installing micarta insulator tubing over the bushings. With this arrangement, the safety factor is vastly improved and still the terminal connections are readily accessible, requiring only the raising of the micarta tubes to uncover the terminal lug connectors.

Leads are brought over to the regulators by means of 5-kv. varnished cambric cables run in a 6 x 6-in. galvanized sheet metal wiring gutter supported above the regulators. One end of this gutter is mounted on the roof of the switchhouse and leads are brought out of the switchhouse and through this gutter to the regulators. Space has been left between the two installed regulators to accommodate a third unit which would be required in case the 2.3-kv. system should be cut over to 4-kv., four-wire.

In switching regulators into and out of service The Southern Sierras Power Company makes the practice of taking both the regulator and its related oil circuit breaker out of service as a unit. To accomplish this the transfer bus first is energized, then the transfer bus disconnects are closed, bypassing the regulator, the line-side oil circuit breaker disconnecting switches are opened and then the charging current of the regulators is broken by opening the oil circuit breakers.

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Demonstrating Safety Beats Talking It

During a three months' tryout of a new safety plan, T. E. Hearn, foreman of the underground department of the El Paso Electric Company, El Paso, Texas, will be safety director in the distribution department of the company, and E. J. Sivalier will assume active charge of the underground department.

Classes of employees now are being instructed on how to do safely those jobs not encountered in regular day-to-day routine. The first of such classes to be formed studied proper methods of connecting transformer banks. From time to time other classes will be organized and will receive instruction from men most experienced in the work to be studied.

Another object of the plan is to effect further improvement in safety by intensive training of men, while actually engaged in their work, to avoid accident hazards. The advantage expected is that workmen can be *shown* better than *told* how to work in a safe manner. So far the plan is working out as expected, and company officials anticipate increased efficiency as well as the establishment of an excellent safety record for the year as a result.

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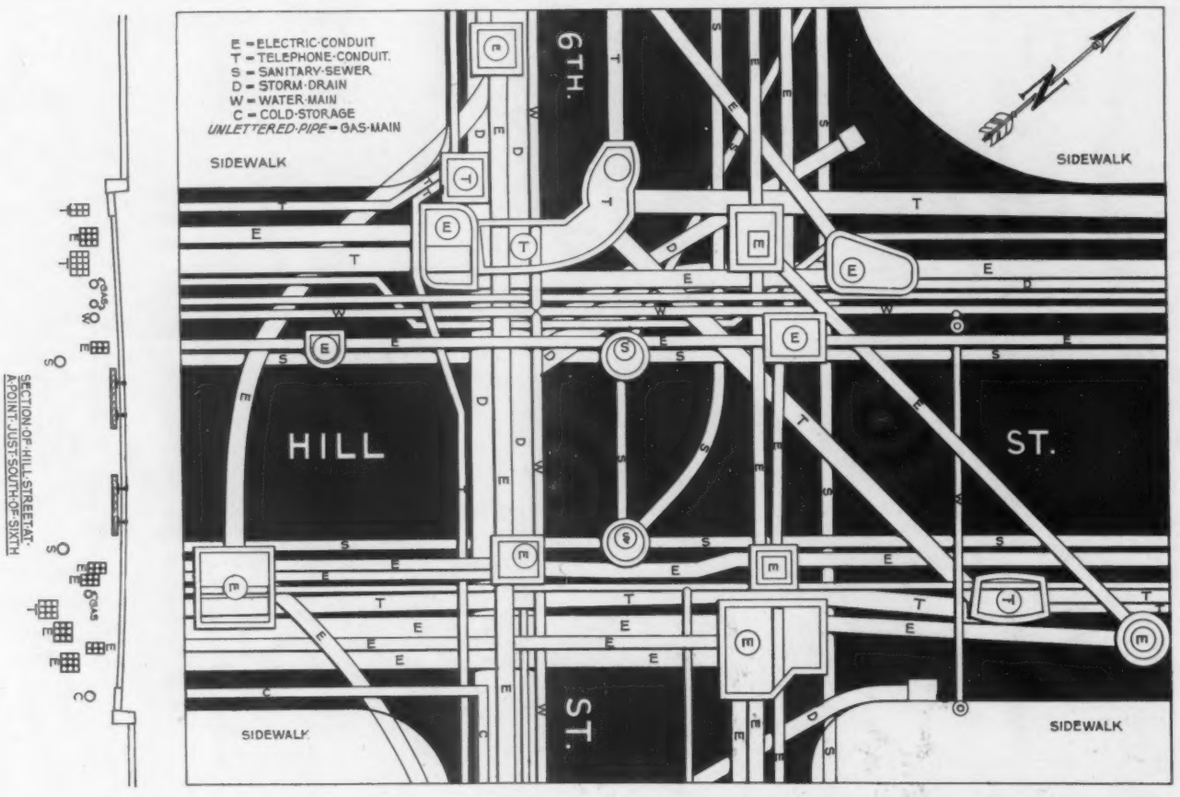
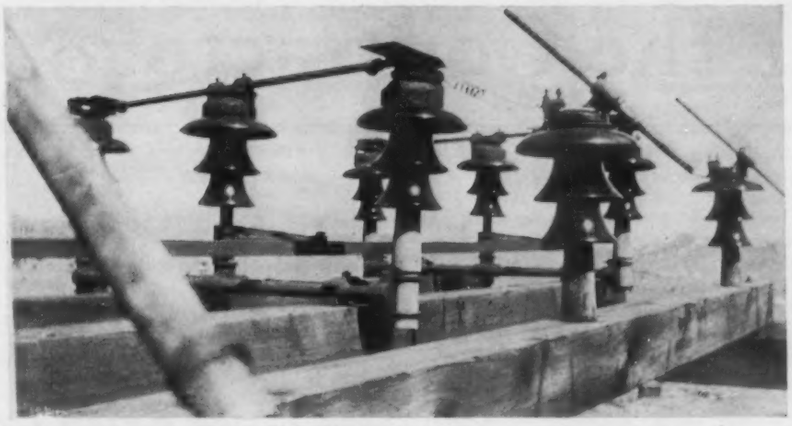
Arteries of Modern Industry



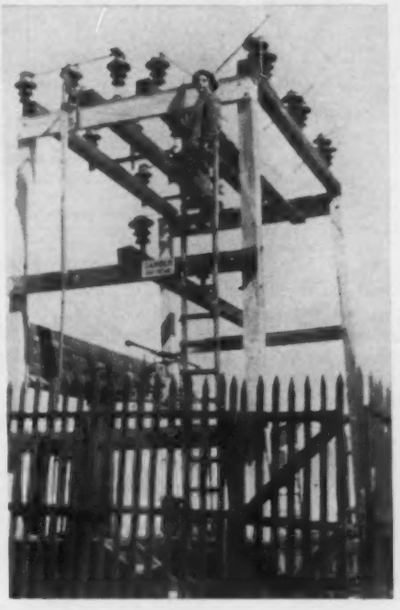
SOME of the problems of the distribution engineer and others whose work involves the planning and execution of underground construction may be better understood after an inspection of the above illustration. A rather pleasing futuristic design in itself, the drawing actually represents accurately the congested conditions existing under the busy intersection of Sixth and Hill Sts. in Los Angeles. Various utility and other service conduits shown, in addition to the double-track street railway and interurban tracks, rather completely fill available space. Wm. F. Fisher, assistant paymaster, Los Angeles Gas and Electric Corporation, prepared the drawing from survey data.

Early Equipment Still in Service



SOME of the electric equipment that has been in service for 25 years at the 44-kv. substation of the famous Horn Silver Mine in Beaver County, Utah, is shown in the accompanying illustrations. Activity on this property has been renewed recently and consequently the old electric equipment that has been installed for so many years is of some interest.

The 44-kv. insulators shown were made up after the design of the Telluride Power Company and subsequently manufactured by various insulator makers. Long oak pins originally boiled in paraffine support the insulators on both the switches and the line positions. Iron wire conductors seem to prevail. The air-break switches were designed and built in the power company's shops near Provo, Utah, and according to company engineers have given reliable service for a quarter of a century—probably assisted by the naturally dry atmospheric conditions prevailing where they are installed.



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Iron Dust in Motor Starter Causes Trouble

An investigation resulting from a short-circuited and burned-out motor starter disclosed the fact that an accumulation of magnetic particles had caused the trouble. The resistance coils of this starter were supported by steel rods passing through the center of porcelain supports. In time these bolts became magnetized and attracted from the circulating air an accumulation of iron particles which settled on the resistance coils, resulting of course in short circuit and burn-out.

When the starter unit was rewound, brass bolts were substituted for the original steel bolts and further trouble was obviated. Where there is metallic dust in the atmosphere it is inadvisable to use steel parts for electric fittings. Brass is more suitable.

Emergency Fused Switch for Temporary Circuit

Where time is all-important and immediate control and protection for an emergency 110-volt circuit precludes the possibility of obtaining the necessary standard fused switch, an ordinary lamp socket may be pressed into service most effectively. Such a socket cut in series with the circuit will take a standard Edison-base fuse plug and provide the required fuse protection.

NEW BOOKS
for the Engineer

INDUSTRIAL ELECTRICITY AND WIRING, by James A. Moyer and John F. Wostrel, respectively Director of University Extension, and Instructor in Electrical Engineering, Division of University Extension, Massachusetts Department of Education. Cloth bound; 469 pages; 281 illustrations; 5½ x 8 in. First edition. Published 1930 by McGraw-Hill Book Company, of New York; for sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Price $2.75.—Divided into nineteen chapters, this book pretty well runs the gamut of practical wiring and related problems. A properly qualified electrician must be familiar with the underlying principles of electrical theory, must be able to do work economically, and certainly should have a knowledge of standard practice. This book should serve well those in the electrical industry who are striving for proficiency in the underlying principles of the art and in present-day standard methods of electrical construction. Completeness of its reference to subjects and sections of the National Electrical Code gives this book added value. Questions and problems also are given.

ELEMENTS OF ELECTRICITY, by Anthony Zeleny, Ph.D., professor of physics, University of Minnesota. Cloth bound; 438 pages; 266 illustrations; 5½ x 8 in. First edition. Published 1930 by McGraw-Hill Book Company, New York, N. Y. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco. Price $3.—This text has been definitely designed to meet the need for a better general understanding of the fundamentals of electricity. It is the outgrowth of many years spent by the author in teaching the subject of electricity to students in first-year courses of college physics. It is sufficiently comprehensive to give a basic understanding of the interrelations existing between various phenomena. These are explained in terms of basic facts and concepts, thus stimulating analytical thinking. Problems and experiments are suggested with each chapter.

ELECTRIC WIRING, by Albert A. Schuler, electrical engineer, formerly instructor in applied electricity, David Rankin, Jr., School of Mechanical Trades, St. Louis. Cloth bound; 5 x 7½ in.; 380 pages; 305 illustrations. Second edition, published 1930 by McGraw-Hill Book Company, Inc., New York. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco. Price $2.50.—A textbook of applied electricity for vocational and trade schools, this book presents a thoughtfully graded series of "jobs" on electric wiring problems and methods. In all, there are 305 jobs, divided into nine units, or groups, according to the general subject dealt with, such as "Bell Wiring, Electric Light Wiring, etc. Questions are given in each case to provoke special attention to the important points involved.

WAVE MECHANICS, by H. T. Flint, Ph. D., D.Sc., reader in physics in the University of London, England. Cloth bound; 4 x 6½ in.; 117 pages; 19 illustrations. Published 1929. Distributed by E. P. Dutton & Company, Inc., New York. Price $1.25.—This is a mathematical dissertation upon one aspect of the new Quantum Theory; a new approach to atomic problems. The theory involved in this book properly is called wave mechanics, and it is based upon conceptions of continuity. No attempt is made to take sides against the other view, the conception of discontinuity, but rather the purpose has been merely to limit the discussion to a single phase of the subject.

MECHANICAL CATALOG, 1929-30. Bound in limp fabrikoid; 1,076 pages; illustrated; 8½ x 11½ in. Published October, 1929, by The American Society of Mechanical Engineers, 29 West 39th St., New York.—This is a combination classified catalog of the products of various manufacturers of mechanical equipment, a general classified directory of manufacturers in the mechanical field, and a professional engineering service directory. Essentially a reference work for mechanical engineers.

BULLETINS of the University of Washington Engineering Experiment Station recently received include:

Bulletin No. 52—Kilovolt-Ampere-Hour Meters, by Gordon R. Shuck, associate professor of electrical engineering. Published Jan. 15, 1930. 38 pages. Price 40 cents.

Bulletin No. 53—The Four-Element Tube as an Audio Amplifier, by Austin V. Eastman, assistant professor of electrical engineering. Published Feb. 1, 1930. 29 pages. Price 35 cents.

Ideas for the Contractor

ADEQUATE WIRING

A Code Responsibility*

By L. W. GOING

Chief Electrical Inspector
Portland, Oregon

The purpose of this paper is to point out briefly:

First: Why adequacy requirements for wiring should be made a part of the National Electrical Code.

Second: What code development has already taken place along this line?

Third: Recommended future development which will standardize adequacy requirements in house wiring.

FROM its inception and up until very recently the National Electrical Code contained only such requirements as would assure proper materials and good workmanship—leaving the problem of service, feeder and branch circuit design entirely in the hands of the installer.

This was probably a fairly satisfactory basis for a code in the early days when lighting constituted the principal demand for current and the volume of electrical work was comparatively small. Then, too, the early-day contractor as a rule took a great deal of pride in his work and possessed definite ideas as to what constituted good practice in wiring and installation.

Unfortunately this condition of affairs is not so universally existent today. Due to the phenomenal expansion of the building and electrical industries, thousands of men have been drawn into the electrical contracting business who have only a smattering knowledge of what constitutes good electrical practice, and not even that of the ethics of the business. These men lack the background of experience possessed by the old-time contractor. For them the minimum standards of the code become also the maximum.

The building owner is not electrically trained and is therefore neither competent nor capable of properly designing his wiring installation. The builder, in the great majority of cases, is also unfitted to pass upon the technical features of electrical layouts. The architect is usually content to pass the responsibility on to the electrical contractor with the proviso that the installation pass city inspection. The electrical contractor, even though he be technically competent and morally responsible, may be, and often is, influenced by competitive conditions over which he has no control.

Municipal inspectors in the larger cities were first to sense the need of reasonable adequacy requirements in the code. They hesitated to approve an installation which, even though complying with all code rules for materials and workmanship, yet was totally inadequate to serve the needs of the consumer because of insufficient service capacity, too few branch circuits or oulets—or both.

The municipal inspector realized that a certificate of approval was commonly considered as evidence that the wiring was thoroughly modern and satisfactory in every respect. It was extremely embarrassing, to say the least, for an inspector to notify an owner that his service must be enlarged or additional circuits and outlets added immediately after the installation had been approved and placed in service. Yet he was compelled to do just this thing or else expose himself to criticism for failure to enforce the code—a code which was quick to recognize deficiencies in a wiring system after it had been completed and placed in service, but which failed utterly to provide definite minimum adequacy requirements for the guidance of the installer.

For this reason, adequacy requirements first made their appearance in the electrical codes of the larger cities. True, many of these requirements were crude and not founded upon reasoning which was fundamentally correct, yet they were partially effective in anticipating the needs of the current user.

The inclusion in city codes of these special rules for adequacy had one bad feature—the requirements were not at all uniform; what would be acceptable in one territory would be turned down in another.

Each city had its own local code-making machinery, and as a result the number of new rules coming off the production line each year were almost impossible of assimilation by the industry. Evidently something had to be done or the national code would quickly be national in name only.

The field secretary of the N.F.P.A. was soon confronted with ample evidence that municipal inspection departments believed it necessary to go further than the national code rules to prevent overloading of circuits and feeders. Much had been said and written about the fuse abuse problem and many cures had been suggested and tried out. Most of these cures were confined to ways and means of ameliorating a symptom, rather than prevention of the trouble.

The field secretary soon found that the greatest success in the solution of the fuse abuse problem had been achieved by those cities that provided adequately for circuits and feeders in premises—that is, by providing a sufficient number of circuits and by judicious location of outlets so that no circuit supplies so great an area that the needs of the current user will be likely to overload the proper circuit fuse.

On the other hand it was found that the least degree of success was achieved in those cities which attempted to prevent circuit overloading by limiting (*a*) the maximum watts per circuit, (*b*) the number of lighting outlets per circuit, (*c*) the number of convenience outlets per circuit, or (*d*) the number of sockets per circuit.

A common sense analysis of the problem quickly led to the conclusion that rules which attempted to control the habits and needs of the current consuming public were only partially effective, and that if rules for adequacy were to be included in the national code they should provide for a wiring layout which would safely meet the average demands of the current user, rather than attempt to restrict these demands to limits imposed by an inadequately designed installation.

Adequacy requirements first made their appearance in the 1928 edition of the National Electrical Code under Sections 613 and 1602.

Section 613 provides that services and feeders shall be of sufficient size to supply a certain minimum wattage per unit of area for various buildings and occupancies. In dwellings and apartments an additional 1,000 watts per apartment is required for appliances.

A study of code rule No. 613 discloses two weak points which must be strengthened if the code is to provide suitable adequacy in house-wiring installations.

1. No guidance is given regarding the number of branch circuits required to distribute energy over a given area.

* Presented at a conference of the Commercial Section of the Northwest Electric Light & Power Association, Spokane, Feb. 13-14, 1930.

2. The allowance of 1,000 watts per apartment for appliances is insufficient in many sections of the country and particularly on the Pacific Coast.

In other words, rule No. 613 is acceptable as far as it goes, but it fails to provide capacity beyond the feeder terminals or panelboard. To be useful to the consumer, electricity must be available in desired quantities at the circuit outlet as well as at the distributing panel.

A study of code rule No. 1602 discloses that branch circuits have been re-grouped into five classes, as follows:

1. Lighting branch circuits are circuits supplying energy to lighting outlets only.

2. Combination lighting and appliance branch circuits are circuits supplying energy to both lighting outlets and appliance outlets.

3. Ordinary appliance branch circuits are circuits supplying energy to either permanently wired appliances or to attachment-plug outlets, that is, to appliances or convenience outlets or to a combination of permanently wired appliances and attachment-plug outlets on the same circuit, such circuits to have no permanently connected lighting fixtures. These circuits are equipped with attachment-plug receptacles and plugs rated at not over 15 amp., 125 volts, or 10 amp., 250 volts; and may have wire of No. 14 gage and be fused at 15 amp.

4. Medium-duty appliance branch circuits are similar to ordinary appliance branch circuits but are wired with No. 10 wire and fused at 25 amp. They are limited to 125 volts.

5. Heavy-duty appliance branch circuits are two-wire branch circuits derived from a 125-250-volt grounded-neutral interior wiring system supplying energy to fixed or portable electrical appliances. They consist of No. 10 wire and are fused at 25 amp. Where attachment plug receptacles and plugs are used for connecting devices to such circuits they must be rated at not less than 20 amp., 250 volts.

The use of appliances on the various classes of circuits is limited as follows:

1. One or more portable electrical appliances, each rated at 6 amp. or 660 watts or less, may be used on lighting branch circuits or on combination lighting and appliance branch circuits.

2. One or more fixed or portable electrical appliances, each rated at not over 1,320 watts, may be supplied by an ordinary appliance branch circuit.

3. One or more fixed or portable electrical appliances, each rated at not over 15 amp., or 1,650 watts, and not over 125 volts, may be supplied by a medium-duty appliance branch circuit.

4. One or more fixed or portable electrical appliances, each rated at not less than 15 amp., or 1,650 watts, and at not more than 20 amp., may be supplied by a heavy-duty appliance branch circuit.

5. Each fixed or portable electrical appliance rated at more than 20 amp. shall be supplied by an individual branch circuit and shall be controlled as provided in paragraph "a" of Section 1,603 of this article. Subdivision of the load by units within an appliance shall not be taken as a basis for determining the character of the circuit supplying a multi-unit appliance.

What the above classification of branch circuits means in facilitating the connection of portable heaters, motor-driven appliances, and like equipment, can be more readily appreciated when we consider that prior to 1928 the national code grouped branch circuits into two classes only, namely:

1. Circuits fused to 15 amp. to which might be connected appliances rated at 660 watts or less.

2. Circuits fused to the capacity of the circuit conductors and supplying individual appliances of capacities in excess of 660 watts.

It is apparent that the new classification of branch circuits will permit the convenient use of the many household appliances now available which are rated between 660 watts and 1,650 watts, and which could not be so used under the old rule. Here again, however, we find the code weak, since it recommends, but does not require, the installation of these special circuits. Nor do the present rules require feeder and service capacity sufficient to anticipate the possible future connections.

Since the present-day needs of the average householder cannot be met without one or more of these special-duty circuits, it would seem reasonable to include in the code some provision making it compulsory to install convenience outlets in certain rooms or locations connected with a branch circuit which is of sufficient capacity to supply any ordinary or normal demand.

We are indebted to Arthur L. Abbott, uniform ordinance department, Society of Electrical Development, Inc., for the following specification for adequate house wiring which provides for such circuiting and location of outlets as will render the best electrical service at a minimum of expense.

1. OUTLETS

At least one convenience outlet shall be installed in each of the following rooms, where any outlet is installed in the room: Living room, parlor, reception room, reception hall, music room, sun parlor, library, den and bedroom.

At least one convenience outlet supplied by a medium-duty appliance branch circuit shall be installed in each dining room, breakfast room, kitchen and laundry, where any outlet is installed in the room.

2. BRANCH CIRCUITS

The total of the standard loads, as specified in Section 3 below, which are supplied by one lighting branch circuit, one combination lighting and appliance branch circuit, or one ordinary branch circuit, shall not exceed 1,000 watts.

The total of the standard loads, as specified in Section 3 below, which are supplied by one medium-duty appliance branch circuits, shall not exceed 2,000 watts.

All convenience outlets in the dining room, breakfast room, kitchen, pantry, laundry and bathrooms shall be supplied by one or more medium-duty appliance branch circuits.

3. STANDARD LOADS

A total standard load at the convenience outlets in one room shall be considered as divided equally between the convenience outlets installed in that room.

The standard load at each bracket outlet and at each lighting or convenience outlet supplied by a lighting, combination, or ordinary appliance circuit and located in any room or space other than those listed above shall be 50 watts, except that an outlet specifically intended for a load greater than 50 watts shall be wired for such specific load.

The total standard load at the convenience outlets in one room shall be considered as divided equally between the outlets installed in that room.

4. DEMAND FACTORS

For gross area of 2,000 sq.ft. or less—demand 100.

For that part of the area in excess of the first 2,000 sq.ft.—a demand of 70, provided the number of apartments does not exceed ten. If the number of apartments is between 11 and 40, the second factor (70) shall be 60. For 41 or more apartments, the second factor (70) shall be 50. The demand factor for each feeder shall be determined in the same manner, i.e., by the area and the number of apartments.

For one medium duty appliance branch circuit—demand 100.

For medium duty appliance branch circuits in excess of one—demand 50.

Based upon such requirements, the average dwelling with an electric range will require a 100-amp. service switch, although small dwellings might possibly fall within the limits of a 60-amp. service switch. The minimum size service switch for dwellings not wired for an electric range would be 60 amp. for a two-wire, No. 6 service, or 30 amp. for a three-wire, No. 8 service.

It might be of interest to know that the City of Portland has for some time required the basement of dwellings and apartments to be wired where either wash trays or heating equipment are installed therein. A lighting outlet must be so placed as to illuminate the front of every furnace or heating boiler and another light within 5 ft. of any wash tray.

It should be noted that the above specification covering adequacy requirements for house wiring is based upon the principle that the normal consumption of electrical energy in each room in the house is dependent upon certain characteristics of the room, chiefly its size and the use for which it is intended. The tabulated values for standard loads would appear to approximate quite closely the normal demand. The important matter, how-

Table of Standard Loads Supplied by Lighting, Combination or Ordinary Appliance Branch Circuits

ROOM OR SPACE	Ceiling Outlets Watts Per Square Foot	Convenience Outlets Watts Per Square Foot	Total of All Outlets Watts Per Square Foot
Living room, parlor, reception room, reception hall, music room, sun parlor, library, den	¾	1½	
Bedroom	¾	1	
Dining room, breakfast room	1		
Hall or passage except reception hall			½
Kitchen	1		

Table of Standard Loads Supplied by Medium-Duty Appliance Branch Circuits

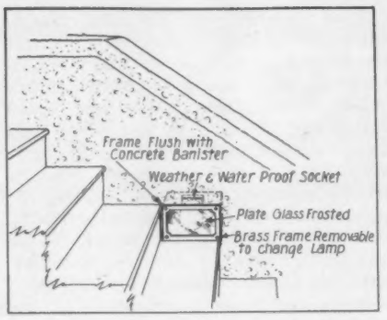
ROOM OR SPACE	Watts Per Room (or listed combination of two rooms)
Dining room, or dining room and breakfast room combined	1,000
Kitchen, or kitchen and pantry combined	1,000
Laundry	1,000
Bathroom	1,000
In any room other than those listed above, where one or more convenience outlets are supplied by a medium-duty appliance circuit	1,000

ever, is the correctness of the method, since the tabulated values of loads may easily be adjusted to suit changing conditions.

It is of interest to note that, while the total of the standard loads supplied by one lighting or ordinary appliance branch is limited to 1,000 watts, and for one medium-duty appliance branch circuit to 2,000 watts, there is nothing to prohibit full use of the capacity of these circuits, to wit, 1,650 watts and 2,750 watts respectively. The layout of circuits, however, provides for a normal load which is less than the maximum safe load, thus leaving a generous factor of safety to take care of unusual or abnormal demands.

Wiring installed outside the corporate limits of the larger cities is generally regulated through state codes. Such codes do not as a rule require more than the minimum prescribed by the national code. Therefore, if adequacy requirements are desired in installations which come under state code jurisdiction, the proper procedure is first to initiate development in the national code.

Even those of little faith in the future of the industry must concede something to the demands of growth.


Frame Flush with Concrete Banister
Weather & Water Proof Socket
Plate Glass Frosted
Brass Frame Removable to change Lamp

Step Lighting for Gardens

PERMANENT installations of garden lighting involve many unique problems. The lighting of a garden stairway at the Marston home in San Diego was accomplished in a rather novel manner by Bruno Barth, of the Airport Electric Company, San Diego. As shown in the illustration, a weatherproof box was set in the concrete balustrade with a frosted plate glass cover flush with the banister. One of these every few steps provided sufficient light on the staircase for safety at night.

THE USE OF LIGHT IN INSECT CONTROL makes up the subject matter of progress report No. 12 of the California Committee on the Relation of Electricity to Agriculture. Incorporated in this report is a pamphlet by Prof. W. B. Herms, as president of the National Association of Economic Entomologists, which deals specifically with a worm that does damage to pears and apples, namely the larva of the codling moth. Professor Herms is of the Department of Entomology and Parasitology of the University of California and the pamphlet is published as a University of California publication as well as one of the C.R.E.A.

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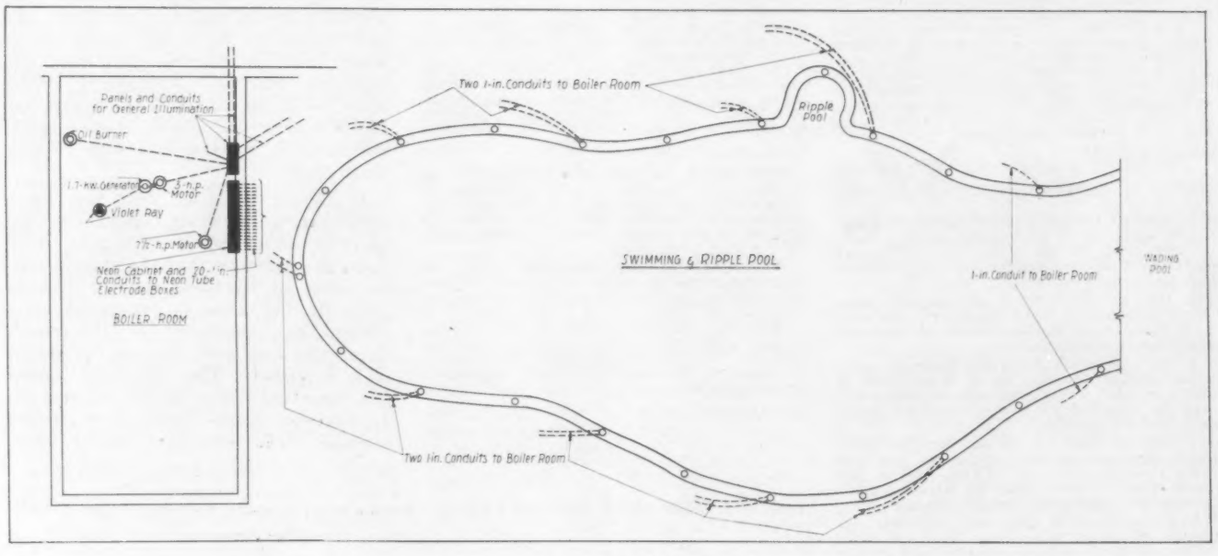
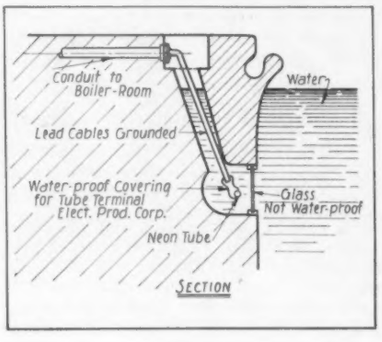
REFRIGERATORS SHOW SAVING IN MILK COOLING—Fourteen Frigidaire milk-coolers and several others of the ammonia type have gone into operation on the system of the San Joaquin Light & Power Corporation, Fresno, Calif., during the past year. A careful check kept on the Frigidaire installation at the Walter Hill Dairy, near Fresno, shows a cost of $62.14 from last June to February. Hill's old records show that his cost for ice for cooling was $75 a month.



Diagrams (above) of pool and transformer layout and (below) of installation method

SWIM IN NEON

BATHING in liquid moonlight is what it is called on the estate of Robert Henderson, at Hillsborough, Calif., where the large bathing pool is illuminated by means of Neon tubing in the manner best shown by the accompanying diagrams. The installation was designed by Harold Gerber, consulting electrical engineer of San Francisco, and installed by Coney and Kuchel Electric Works as part of an extensive electrical system at the Henderson residence. This pool lighting has operated successfully for two years, (the details of its construction only now being released). This fact is attributed first to its design, enabling easy removal and replacement of tubes; second, to the effective waterproof tube terminal covering developed by the Electrical Products Corporation, and then to the placing of all transformers in a dry location in the boiler room. Mr. Gerber made considerable research into Neon lighting in connection with this and other new uses at the time.



PLANS SHALL BE FILED

Los Angeles Requires Plans on All Buildings of 20,000 Square Feet or Over

RESPONDING to an insistent demand from the electrical division of the Department of Building and Safety, the Los Angeles Electragists, the Estimators' Section, and contractors generally, the Board of Building and Safety Commissioners of the City of Los Angeles recently considered and then adopted the following rules requiring more complete information on proposed electrical work of a major nature:

1. Electrical plans or layouts shall be filed with every application for a building permit on the following classes of buildings:

(*a*) Theaters, motion picture show buildings, lodge halls, public halls, hospitals, asylums, sanitariums, or any place of public assemblage.

(*b*) All buildings whose aggregate floor area is 20,000 sq.ft. or more. This area to be determined by the outside dimensions of the building.

2. This electrical plan or layout must contain complete information as to the location, size of each panelboard and switchboard, and spaces allowed for the installation of the same.

3. This electrical plan or layout must contain complete information as to the size of conduits, size and number of wires contained therein, and the electrical load they are to carry up to the final distribution center.

4. Each electrical switchboard, panelboard, or distribution center shall show the total connected electrical load to be supplied from such switchboard, panelboard or distribution center.

5. Each electrical outlet shall show the electrical load to be connected thereto and the distribution center to which it is to be connected.

6. If an electrical plan or layout is approved by the electrical division, Department of Building and Safety, a permit will be issued for the work as shown on such electrical plan or layout. No deviation from conduit or wire sizes, panel or switchboard sizes, or their location, except on circuits beyond final distribution centers, will be permitted after the permit is issued, except by compliance with the procedure noted below.

7. If the owner or his authorized representative desires to make changes in an electrical layout, he shall file a written request, together with duplicate copies of supplemental plans or layouts, showing the changes desired.

8. Upon the approval of these requested changes, one copy of these supplemental plans shall be returned to the owner for his files, and the other retained in the electrical division of the Department of Building and Safety.

9. When an application is made to the electrical division of the Department of Building and Safety for a permit covering the installation of the work provided in the original plans or any approved changes thereto, the applicant for such permit shall file a written statement with the chief of the electrical division that all work proposed to be installed is in accordance with the approved electrical plans or layout, the electrical ordinance, or the electrical orders established and on file in the division of electricity.

The rules resulted from several conferences conducted by F. J. Connolly, executive secretary, California Electragists, Southern Chapter, and all interested parties. The operation of the plan is resulting in improved electrical installations, proper engineering of work, quality specifications in many cases where only the cheapest would have gone in before, and a generally improved condition.

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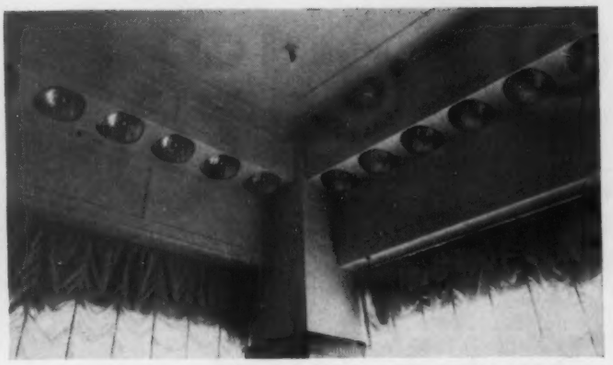
HILD OF STOCKTON

COMPLETENESS of stock and equipment characterizes the Hild Electric & Manufacturing Company, electrical contractor-dealers and manufacturers of panels and switchboards, at Stockton, Calif. Above are shown at left the completeness of the merchandise lines carried, even though the store and plant are remote from the main business district; and at right the orderly and complete stock of wiring materials and fittings in the large basement storeroom. The building occupied covers half a block and provides ample office, fixture display room, merchandising, stock, shop and garage space on two floors and in a basement. This company operates in a wide range of types of installation, embracing industrial, commercial and residential jobs in the upper San Joaquin Valley region.

One of several fixture rooms



ABOVE: *Window lighting is particularly flexible. Ventilation is provided above all units. All units are wired on alternate circuits with control panels located near by. Each has ample spot and floodlight special outlets. The de luxe daylight window shown above is equipped with 500-watt reflectors on 18-in. centers. A narrow window, shown at left above, employs prismatic covers to keep the light in a narrow beam*

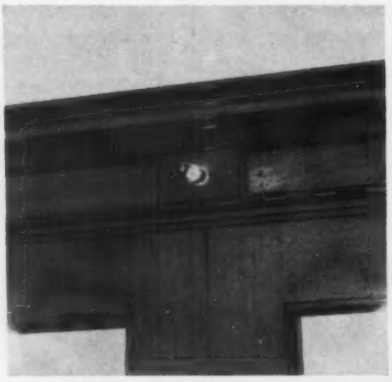
O'CONNOR MOFFATT

San Francisco

[Second of a series picturing interesting installation features in Pacific Coast department stores recently built or remodeled]

FREDERICK WHITTEN, construction manager for O'Connor Moffat & Company's new store in San Francisco, placed a heavy responsibility upon the electrical contractor, Charles A. Langlais. He was told to anticipate every possible future electrical need and to provide for it. The details of this task rested upon Tom Bennett, estimator, and Frank Lynn, superintendent. It was also given to the contractor to install all auxiliary equipment, even to lamping fixtures, Telechron clocks, interphones and motor equipment.

The building was unusual in that it was an eight-story structure erected over a previous four-story building, with provision for two more stories later. Wiring of the lower portion of the building then became a super-rewiring job.



LEFT: *Silent call system, push button operated, for calling floorwalkers on the main floor*

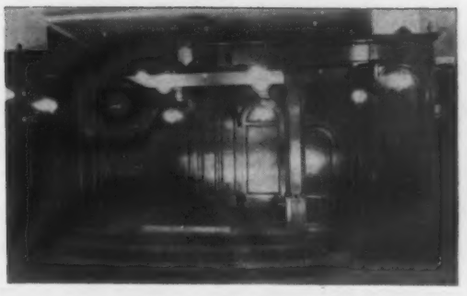
BELOW: *Children's barber shop with its modernistic lighting is part of the beauty salon which started out with 35 kw. and ended with 80 kw. connected and a 72-circuit panel*

LEFT: *Modernistic cove lighting and fixtures in the beauty salon, with ample polarized convenience outlets, and directly beneath it a manicure table station with 10- and 20-amp. receptacles and "mystic ray" applicator for cuticle removing*

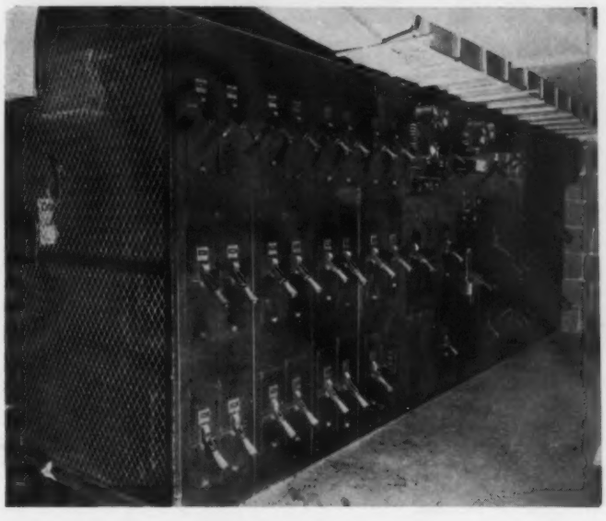
ABOVE: *The main floor lighting units of celestalite glass are 500-watt units, each on a separate circuit, making future increases possible. At right is shown one of many "shadow boxes" or special show windows above the sales floor, illuminated by means of a trough strip, lamped with six 25-watt lamps and adjustable so that objects displayed may be spotlighted rather than the entire booth lighted*

LEFT: *The "Thrift Floor" or basement was rewired completely with metal molding and fixtures taken from the old store and now used on closer spacing (12-ft. centers) and lamped with 200-watt lamps, creating a very fine illumination. The conveyor system also may be seen below the ceiling*

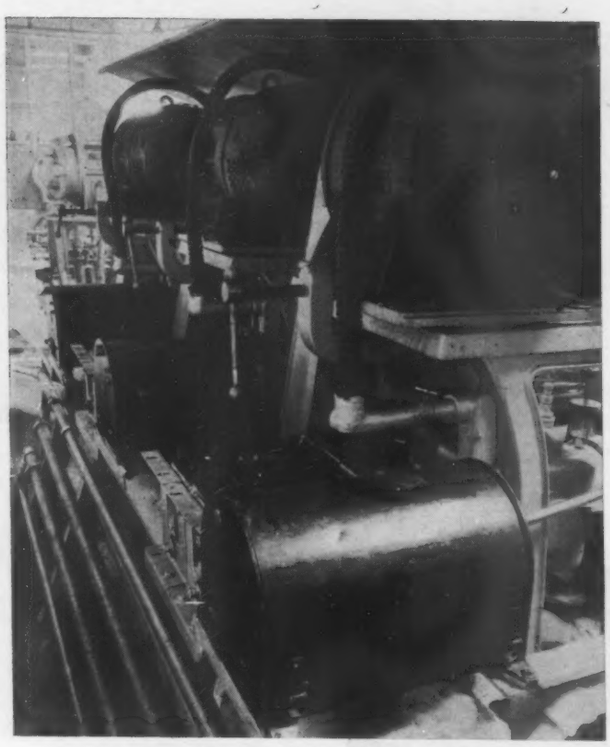
BELOW: *To assure facilities for all possible future needs on the main floor a "mattress system" was laid in the marble grouting. Weatherproof boxes with brass removable covers give access to circuits and conduits running from the center of each bay to all possible future showcase locations*



ABOVE: *On the manequin stage on the second floor, besides ample general and decorative lighting, a disappearing footlight trough was installed to light the models as they step forth to show a new Paris creation*



LEFT: *Main switchboard in the sub-basement is fed directly from a transformer vault by three single-phase feeders. In anticipating the requirements, an extra panel on each end of the board, one for power, another for lighting, was provided and before the job was done these were found to be needed for the added load*



Motor, drum controller, and grid assembly

VARIABLE FREEZING

How the Production of an Ice Cream Plant Was Greatly Increased by Use of Speed Control on Motors.

By FRANK SLOAN
California Electric Works, San Diego

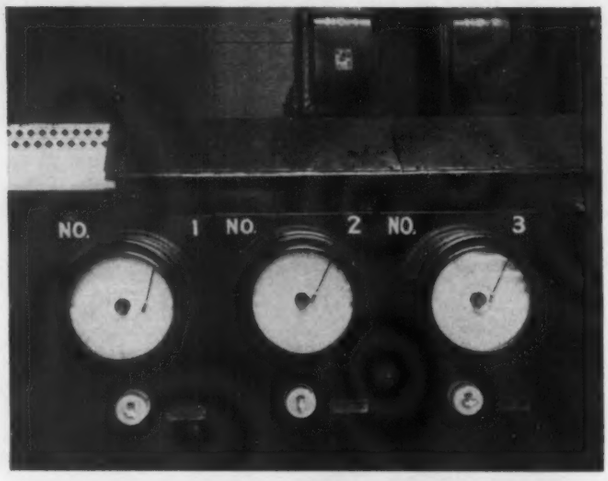
SMOOTHER, tastier ice cream, produced faster than ever before, was the result of a change in the method of freezer control designed by Wilber A. Thomas, secretary of Hage's Ice Cream Company of San Diego, and worked out by our shop not long ago. Developing an idea pioneered by Turnbow, an eminent food chemist, Mr. Thomas wished to elaborate on a two-speed idea of freezer control. Two-speed variations were not sufficient, he felt, since the speed tended to increase with the unloading of the freezer, resulting in damage to the texture of the final portions of the batch. Mr. Thomas also wanted faster freezing speed and likewise a graphic method of recording and checking on the time used in various stages of the process.

Our motor installation was made, then, to bring the efficiency of the freezing plant up to a maximum. The freezers at high speed ran originally at 210 r.p.m. Now they run at 240 r.p.m., giving much faster freezing. The plant is capable of turning out with three freezers 720 gal. of ice cream per hour, making twelve runs during the hour. This is considered remarkable and the officials of the company believe they have the fastest freezing plant in the country.

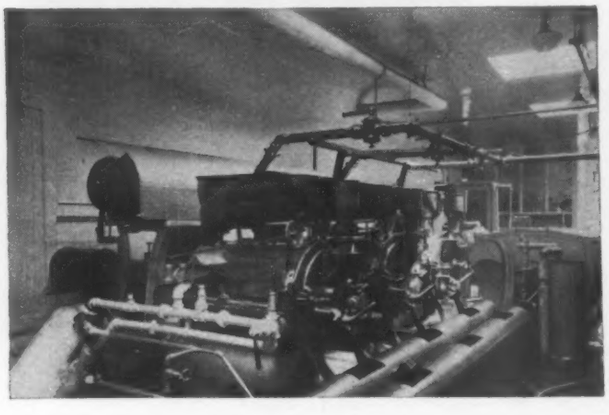
Only two speeds are used, the high for freezing and the low for emptying the freezers.

The original squirrel-cage motors were replaced by slip-ring motors, and frames were built into the back of the freezers for the drum controllers. The latter were turned over on their sides and the control rods run through to the front of the machines for easy operation.

The first trouble was experienced because the motors gained on the low speed as the ice cream was emptied and the load lightened. This was overcome by connecting the rotor circuit on the drum controller and grids in such a way as to single-phase on low speed. This single-phase condition keeps the motor from gaining speed quite successfully even though the motor load lightens.



Instruments which keep records of batches and indicate time for each step of the process



Freezers, showing motors and control mounted at rear

Graphic instruments have been mounted in plain sight of the operator so that he can tell from them when the cream reaches the drawing point of the freezing cycle. Much time is saved in this way. Likewise a record is made on a chart, which indicates by peaks the number of runs of each freezer.

These instruments resemble ammeters and are connected in the primaries of the motors, registering according to the load of the motors and giving an indication of the condition of the ice cream.

On blind tests brought to the laboratory the controlled freezing samples can be picked readily by the evenness of the texture and the quality of the cream. The method itself is equivalent to a 2 per cent increase in butter fat in the product, it is said.

forum

in the interest of a better motor trade

POWER FACTOR CORRECTION

Power Companies Are Beginning to Penalize Low Power Factor in Industrial Applications.

By HAROLD GERBER
Consulting Electrical Engineer, San Francisco

AS USES of electricity advance a larger proportion of the equipment manufactured for electrical power utilization is designed for alternating current application.

The very fact that the equipment is to operate on alternating current is enough to make one realize that it has inherent features that greatly add to the cost of power.

Most equipment designed for alternating current work embodies a great deal of iron and steel in its structure. When such equipment is placed upon an alternating current source of supply a definite portion of the current input to the equipment is used to magnetize the magnetic circuits within the equipment. This magnetizing current is costly, as it adds to the distribution load and does not produce any work.

Induction motors and other forms of inductive equipment, when connected to power sources, take a component of current from the line, which lags behind the voltage of the line and results in a decided lowering of the power factor. The magnetizing component of the current is nearly constant for all loads on an induction motor, as it is usually 90 deg. out of phase with the line voltage, or at 90 deg. to the current which is utilized for power.

As the magnetizing current value is nearly constant, it can be understood that at no-load the motor takes about one-third of full load current, this current being used mostly to supply magnetizing current to the motor. If there is a group of lightly loaded motors on the line, the current can be very large when all of the motors operate at low power factor. The bulk of this current is wattless, producing little power and increasing distribution losses.

On large industrial installations this condition has created a new problem for the serving company. The watt-hour meter that is supplied by the power company measures kilowatt-hours only. In other words, it measures only the amount of current that produces useful power. The wattless current does not register on the watt-hour meter. This means that the power company's distribution system, including feeders and transformers, has to be of sufficient size to carry large currents, and the amount of energy recorded does not compensate for the huge losses incurred.

In the territory served by the Great Western Power Company and the Pacific Gas and Electric Company a new section in the schedule of power rates has been authorized by the Railroad Commission. It reads as follows:

P-1 RATE SCHEDULE
Special Conditions

(*e*) Power factor clause: Where consumers have total connected loads of 500 hp. or more, charges for energy shall be adjusted for weighted monthly average power factor in accordance with the following. If the power factor exceeds 80 per cent lagging, or is leading, the bills shall be reduced by 0.3 per cent for each 1 per cent of such excess up to 90 per cent power factor, inclusive, and by 0.2 per cent for each 1 per cent of such excess over 90 per cent power factor, provided the maximum reduction shall not exceed 5 per cent. If the power factor is less than 65 per cent, the bills shall be increased by 0.5 per cent for each 1 per cent of such deficiency in power factor, provided the maximum increase does not exceed 5 per cent. For this purpose the power factor shall be computed to the nearest even 1 per cent, provided that in no case shall the total charge be less than the minimum charge.

It can be seen then that on installations of over 500 hp. in connected load necessary steps will be taken to penalize consumers for low power factor operation. It is to the advantage of the consumer to find means of improving the power factor of his own installation.

EQUIPMENT WHICH IMPROVES

There are several ways for the consumer to improve the existing power factor. They are as follows:

1. *A complete survey* of the installation should be made, the load factor of all motors should be ascertained, and should be made to reach as high a value as actually is possible. Underloaded motors are one of the many causes for low power factor.

2. *The use of synchronous machinery.* This may consist of one of two types, (*a*) synchronous condensers, or (*b*) the use of synchronous motors. When a synchronous condenser is used the full capacity of the machine is used for power factor correction.

(*a*) The effect of a condenser in an a.c. circuit is to cause leading current. Since a synchronous motor with overexcited fields has the same effect, this leading current has a tendency to neutralize the effect of any of the lagging current of the system.

(*b*) Synchronous motors are of the same type as a synchronous condenser, except for the fact that a portion of the load is used to furnish mechanical energy and the remainder is used for power factor correction. This type of motor is used to supply fairly constant loads during the periods of low power factor operation of the plant.

3. *Another method* is the use of static condensers, or capacitors which are units of fixed capacity values. These are installed either at the individual unit of machinery that is in operation, or in bank at the service location or center of distribution for circuits or sub-feeders.

In fact the subject of power factor correction deserves considerable study by the motor specialist, not only as to the effect of the equipment but also the characteristic installation conditions of such equipment.

In July another phase of this subject will be discussed here.

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Conveyor Speeds Cutter

IN MAKING up small special transformers, a service which the Farnsworth Electrical Works, of San Francisco, has equipped itself to do in quantity, large numbers of small pieces of core iron are necessary for laminated cores. To facilitate cutting such core iron, which comes in sheets, a press type of cutter, shown above, was equipped with a conveyor belt. This belt removes the cut pieces quickly and allows a second cut immediately, speeding up production. As will be seen in the photograph, the conveyor itself runs at the back of the main shears in such a way as to bring out the cut pieces at one side and drop them into a box below. Drive for the conveyor is provided by equipping the end of the large upper shaft of the cutter with a wooden pulley, running a belt to another shaft set at the back of the cutter which drives, through beveled gears, a pulley at the end of the belt.

Similar applications can be sold to industrial plants using power shears.

Better Merchandising

WOMEN AND CHILDREN

Company Women Helped Sell in One and Children Sought Prizes in Another Range Campaign of This Northwest Company.

WOMEN and children are close to the home and home is where the range goes, so to women and to children the range campaign appeals of two recent successful drives of the Puget Sound Power & Light Company, Seattle, were made.

In the case of the women it was to employees of the company that the appeal was made. The women's committee was to receive for its fund a credit of $1 for each 1 per cent of total company quota sold up to 100 per cent and $5 for each 1 per cent over the quota, dividing this amount among district groups of the women's committee, based on a predetermined system of points earned on sales in each district. This system of points had been determined by the average weekly quotas sold, with greatly accelerated credits for going over the weekly quota. In this women's committee contest the fund accrued to $181.86, the total points gained amounting to 24,249, giving a value of three-fourths of a cent for each point. The division of the fund among the women's committee by districts naturally followed the comparative district standing in the range campaign proper.

The "Quota Clock" showed 116.1 per cent when the spring campaign ended. Below: A few of the large advertisements in the "Mother Goose" prize contest series

"No doubt the women of the company played no small part in the success of this campaign," said R. W. Clark, merchandise sales manager for the company, "and it is hoped that on account of their strategic position in the business of the company a check of their work in this case will suggest rather definite methods by which they can co-operate in a tangible way in other programs for developing increased use of current consuming devices."

Certainly one thing was evident in the campaign. Every woman employee constituted herself a saleswoman or prospect finder for the company's merchandising program. When Mr. Clark had tabulated up the results there were 2,369 ranges sold individually to residences, 1,000 to apartments, and 542 water heaters, a total of 3,911 units, estimated to add 24,000 kw. to the connected load. This exceeded the previous fall campaign by 876, and the 1928 campaign by 315 ranges.

Children Appealed To

A prize contest with a particular appeal to children, and through them to grown-ups, was the feature of the advertising accompanying the fall range campaign of the Puget Sound Power & Light Company. Mother Goose furnished the motive, and many of her jingles were admirably adapted to bringing out the essential advantages of electric cooking, while the concentration on the advertising required of the contestants over the campaign period centered the attention of many homemakers on modern cookery as exemplified by electric ranges.

In each of seven weeks of the thirteen-week campaign the advertising

carried a jingle about electric ranges in the meter and style of a Mother Goose rhyme. Children under the age of 13 were permitted to enter the contest, which consisted of identifying the original of the rhyme and reporting a complete set of answers at the end of the period. Answers were made simple and obvious enough to encourage entry in the contest, and since correctness was easy, particular credit was given for completeness and originality.

A total of $750 was offered in prizes divided among the seven districts of the company, allowing 23 prizes per district ranging from $25 down to $1, with the grand prize of $50 open to all district contestants. A large number of entries completed the contest, but only 250 of the most likely ones were turned over to the judges, consisting of certain prominent citizens of Seattle outside the company. The grand prize was awarded to a 12-year-old girl of Kelso, Wash., who returned her answers in original verse embellished by her own illustrations. Each answer brought out a favorable reference to electric cooking.

Results of the campaign were again indicative of the company's proficiency in selling ranges and helped sustain the long standing record attained by the company in this activity. According to Mr. Clark, against a quota of 1,534 ranges the campaign netted 1,822 sales exclusive of sales to apartment houses, exceeding the 1928 fall campaign by 316.

SAVE THE DELIVERY CHARGES

NOW that nearly every person owns and drives an automobile, there is no reason why the dealer in electrical appliances should have to deliver the small electric articles he sells. He should encourage his customers to carry them home themselves, for delivery costs are high and dig deep into the profits in some transactions.

Jack West, in charge of the sales floor of the Public Service Company of Colorado, Denver, keeps the delivery of the merchandise in mind and strives to get as many of the customers to carry their purchase with them as possible. Of course, it is impractical to suggest to the customer that he cart the newly purchased electric refrigerator, or stove, home in his own car, but, if he is careful, he can encourage him to take home the electric toaster, waffle iron, heating pad, and even the floor lamp and electric sweeper. It is more difficult to get customers to take electric irons home with them. The reasons are purely psychological.

An electric iron is commonplace; nothing interesting about it any more. There aren't many customers who will hurry to take an iron out of its box, hook it to a socket and see how fast it heats up and marvel at its efficiency. But a waffle iron is different, so is an electric toaster or a small grill. The customer is anxious to play with it, to see how it works, to enjoy the products of its labors.

"I usually end a transaction by asking the customer, 'Do you have your

car with you?' If he has, then it is no trouble to continue the suggestion by saying, 'Why can't we take this over and put it in the car for you?' If the customer doesn't have an automobile, the mere fact that you asked him if he had his car with him, flatters him. He'll not tell you he hasn't a car, perhaps, but will assure you that he did not bring it downtown with him. Then of course I say we'll be glad to send the goods out.

"In the course of a year, much money in delivery costs may be saved by this method."

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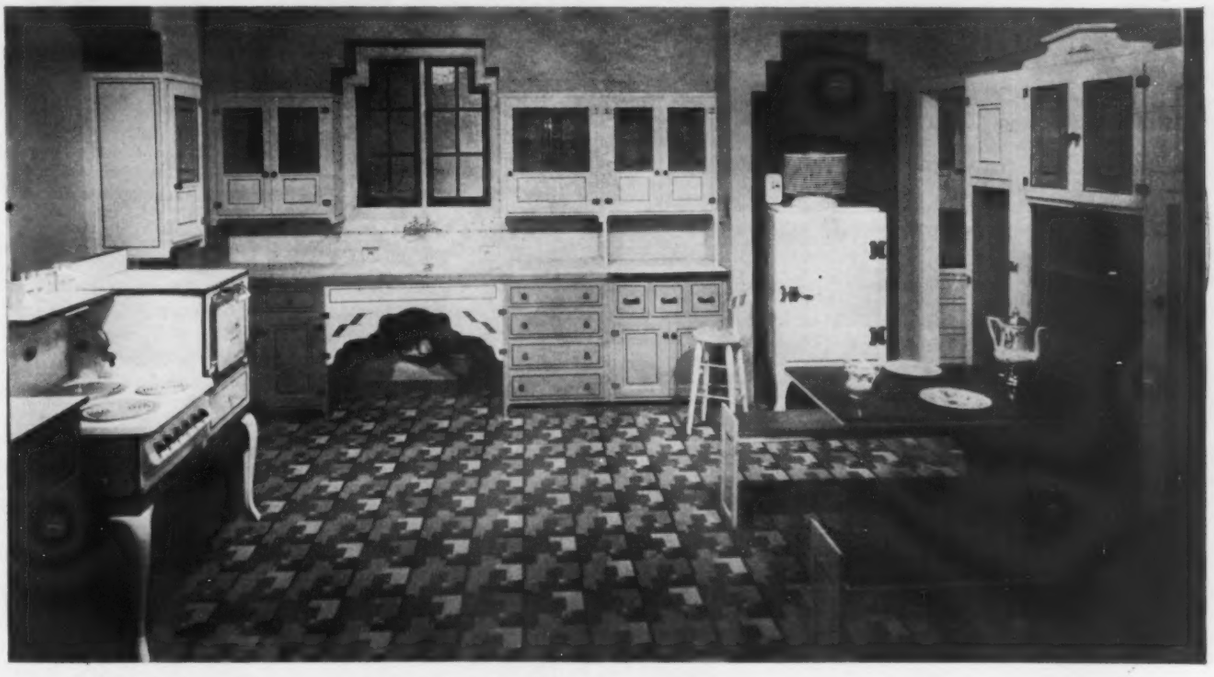
Modern Kitchen Has the Modern Touch

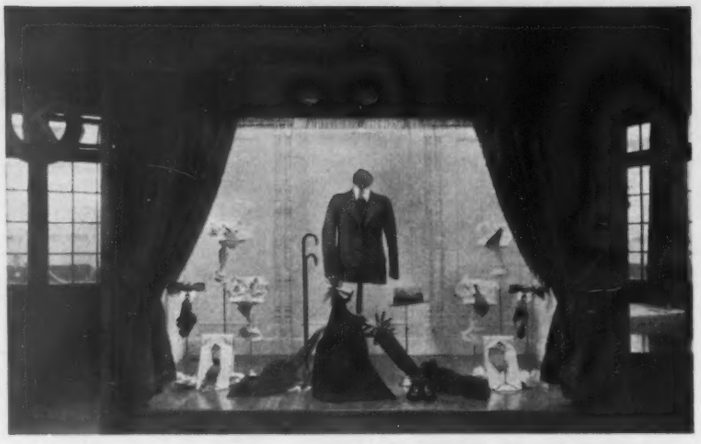


THE model electric kitchen in the new H. C. Capwell store in Oakland is equipped with an electric range, electric refrigerator, electrically operated dishwashing machine, electric percolators, and other appliances. In such a setting these various electric kitchen utensils are displayed and demonstrated. The entire end of the model kitchen facing the main part of the store is open, permitting customers on all parts of the floor to have a complete view of all equipment and making the kitchen a stage from which demonstrations may be held.

BARNSTORMING WINDOW

Portable Show Window Used to Demonstrate Lighting to Luncheon Club Groups in the Monterey Area

By MILO A. CAIN
Illuminating engineer, Coast Counties Gas & Electric Company, Santa Cruz, Calif.



The portable window set up at a luncheon club meeting

SEEING is believing—at least the Coast Counties Gas & Electric Company has found this a good theory to follow in the sale of proper window lighting. And as proof of this statement, it points to the improved appearance of the merchants' windows throughout its territory since the inauguration of the use of a model display window for this purpose.

"Kill the shadows, aid the color schemes of your merchandise by the use of proper colored lighting, and make your sales jump." This has been the slogan of an intensive educational lighting program sponsored by the company.

To aid in this program, a series of talks was prepared to be given before the various service clubs, using this model window to demonstrate just what effects can be gained in the same display by different methods of lighting.

Before the meeting the window is placed in a semi-darkened room and the display arranged by one of the leading merchants of the town. To create discussion, the window is left with one glaring light placed conspicuously in the center, while dark shadows lurk in every corner. The men comment on this; oftentimes someone even comes over with the remark, "Huh, I always thought you fellows knew your stuff, but look at that window!"

By the time luncheon is over, this window has made its indelible mark on the lighting consciousness of even the most uninitiated, and the strain is broken with this remark:

"Gentlemen, you see before you a perfect example of one of the most effective ways to drive away prospective purchasers. Don't do it."

Now ready for the real business at hand, the first thing is to show how the general attractiveness of the window can be increased merely by changing the placing of the lights. Then it is shown how the use of color to intensify the colors of the display will further improve the window.

Four basic colors are used for this—amber, red, green and blue, depending on the colors predominating in the window display. Combinations of the various colors are also shown. However, the merchant is cautioned against the use of blue light, as it is very easy to kill an entire color scheme in this manner.

Formerly an electrical dealer in Santa Cruz, Milo Cain has been made illuminating engineer for the Coast Counties Gas & Electric Company. He designs installations working in conjunction with the electrical contractors in the territory and assists in the sale of better lighting.

Another important feature brought out is that proper window lighting equipment need no longer be considered as part of the building, it can now be installed, changed or removed to fit existing conditions, just as are counters, cash registers and office furniture, by means of adjustable strip troughs.

The use of spotlights to call particular attention to unusually attractive articles in the window is also demonstrated.

As can be seen from the accompanying photograph, the display window is not a toy, but it is large enough to display effectively fair examples of the merchandise to be found in the merchants' windows. It is approximately 8 x 10 x 7 ft. in dimension and is constructed of sugar pine. Its 25 sections are screwed together so that it is easily transferred from one place to another.

The lighting equipment of the window consists of 21 X-ray reflectors using 150-watt clear lamps, 10 sets of color combinations employing red, blue, green and amber screens; 2 window floodlights equipped with spill rings; and a 200-watt clear lamp on a cord drop with an 8-in. corrugated porcelain reflector for "improper" window lighting. Twenty feet of Curtistrip is used in the ceiling to which reflectors are attached. Lights are controlled in groups of three with an eight-gang tumbler switch plate in the left side of the wall support. Cords, through 30-amp. polarity flush receptacles, provide the method of connecting the various circuits from the control point.

The entire window can be assembled, including the placing of the display, in approximately an hour and a half.

Samples of the Curtistrip used for the installation, the color screens and reflectors, spill rings and the new lamps are kept on display for detailed examination after the close of the meeting.

To vary the program from time to time some well known dealer in the town is selected. In dialogue he is sold a complete job of improved window lighting. A great deal of amusement can be evoked in this way and it breaks the monotony of repeated showings. Because some one of the prominent merchants in town is called upon each time for placing the display, it creates more general interest in the meetings. Also, the dealers are enthusiastic about the showings, because additional window lighting means more business for them, and helps cement the feeling of good will between the public and the central station.

HOME SERVICE THAT PAYS

Because it Avoids Obvious Selling and Allows the Merchandise to Sell Itself Silently and Visually

The main auditorium is used for meetings and parties, as shown above, while the merchandise displays are permanent exhibits that line the walls. One of them is shown in the lower picture

CARRY out home service work in such a manner that its object is not obvious. The less the service appears to be a part of the company's merchandising program, the more it helps to sell, the Central Arizona Light & Power Company, Phoenix, has discovered.

"We believe," explains J. S. Arnold, sales promotion manager, "that the most profitable way to sell electrical appliances is to establish the name and reputation of the company so firmly and favorably in the minds of the local housewives that they will think of the company as a matter of course when they are thinking of buying appliances.

"And we have found by experience and observation that to accomplish that state of mind, it is essential that the public service company which conducts a home service department in conjunction with its merchandising activities outwardly forget all about actual selling when it invites women to make use of the service of that department.

"Women come here for the first time half expecting that there is a catch somewhere, that we would not be offering all this free service unless there was a 'hereafter.'

"So, our plan is to surprise them pleasantly by having them observe upon their first and succeeding visits to our home service floor that there are no strings tied to our offer of this service, that they really do get something for nothing. Consequently, when they leave without having been pressed, either directly or by inference, to reciprocate by purchasing electrical appliances, they feel more kindly toward us."

The company holds cooking schools, washing demonstrations and other events which suggest directly the use of the various appliances on sale, using the home service clubroom in the basement of the store for them. But these demonstrations are only a minor part of the work of this department, for two major reasons.

"In the first place, we want to have the basement of our store filled every day of the week, or as nearly that as possible," Mr. Arnold explains. "That would be impossible with nothing more interesting or novel than demonstrations of appliances and cooking schools to attract visitors. Too many demonstrations kill their value.

"In the second place, too many demonstrations likewise make the object of our home service department too obvious. We never hold demonstrations more often than one a week."

When the company had the basement of its store decorated and fixtured for the use of the Home Service Department, it sent out letters and made telephone calls to the officers of the 23 women's clubs and organizations in the city, offering them the free use of the room for their meetings and parties.

There was an immediate response to this offer. Seven large clubs accepted the invitation immediately. Others came in gradually. Mr. Arnold believes that eventually all of the 23 organizations will be using the room for their regular meetings, if it is possible to arrange a schedule which will permit.

There are stacked in one corner of the room bridge tables to accommodate approximately 125 bridge players at once. Any group of women may use the room and these tables for a bridge party at any time, if the space is not already promised for the same hours.

There is cooking capacity in the kitchen of the room to prapare meals within a brief period for 125 people. There is no charge at all for the use of the equipment and room; and the company will even furnish a cooking demonstrator to help with the preparation of the meals.

The users of the room have it entirely to themselves save the presence of one woman employee of the company; and she is not there in the capacity of salesperson by any means. Primarily she acts as hostess, to greet the club members and make them feel at ease and under no obligation to the company for its service. Most important of all, she never mentions appliance selling.

The only obvious suggestion of appliance merchandising is noted in inconspicuous wall booths around the floor of the basement room. These displays are permanent. Here are shown all the important appliances carried by the company; but the displays are confined to the wall lines of the floor and at no time are permitted to utilize the floor proper.

Otto K. Oleson Does Things in The

LEFT: *Mr. Olesen, (center) has good looking movie actresses give the certificates of award for cake making to the sturdy homemakers who know their recipes and bring home the bakin'*

ADVERTISED as the largest electrical establishment in the West, the new store and shop of Otto K. Olesen on Vine St., Hollywood, Calif., lives up to the general reputation of the locale for being bigger and better than elsewhere in most everything. Where the movie colony lives and works the general atmosphere of vastness is particularly appropriate.

Mr. Olesen first came into prominence because of the spectacular lighting which he provided for the exteriors of moving picture theaters for the premieres of new motion pictures. It was not long before other commercial establishments were making use of the same service. A new store never opens, a new hotel is never dedicated or a new line of models in automobiles announced without Mr. Olesen's floodlighting equipment trained on the building or making patterns in the sky. A host of imitators has sprung up, but whenever things must be done up in style Otto Olesen still has the biggest and brightest equipment.

A sizeable building is needed for the garaging of this equipment alone. Roughly, it consists of 16 truck-mounted, gas-engine-driven motor-generator sets, a few transformer sets on trailers, a dozen 6-ft. searchlights on individual trailers, and airplane motors and propellers for wind, snow, and similar effect work. This with a large rental stock of equipment on standards, effect machines and projectors of various kinds, takes a large warehouse.

ABOVE: *Looking from the health appliance department into the washington machine and refrigerator display area. This area has assigned to it a large window equipped with floods and spotlights, so that a dramatic effect is produced when viewed from the street*

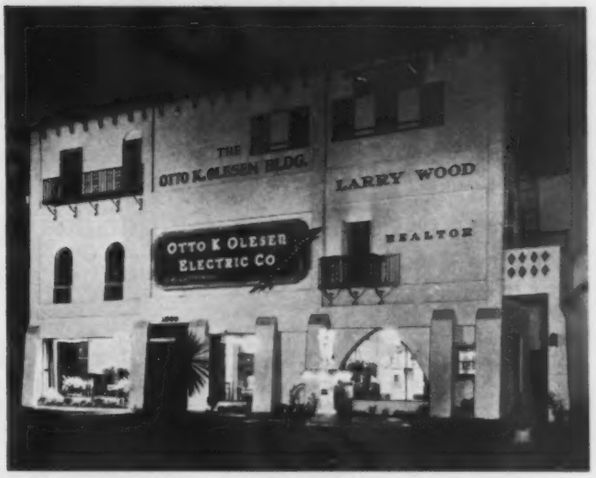
Because all this equipment is made in his own shops, the shop department, above the warehouse, is likewise a large institution. The entire front of this building, therefore, is ideal for an equally spacious merchandising store.

Upstairs above the store is an auditorium, among other things, in which cooking demonstrations are held each week, luncheons are served and campaigns on ranges and appliances are given a send-off. These demonstrations are no ordinary affairs, either. Movie stars are present and bestow the prizes upon the winners thereof. A dancing school for children, which rents the auditorium during part of the week, provides entertainment for the visitors to cooking classes. Famous chefs are brought over to judge cake contests. It is all done in the very best Hollywood manner.

Lighted by mercury vapor and hot cathode neon units, the large windows of the radio department (left) attract considerable attention by contrast. An idea of the spaciousness of the display room is gained when it is considered that this radio corner occupies only about a quarter of the floor area

HOLLYWOOD MANNER

When in Rome it May Be Necessary to Do as the Romans Do, but in Hollywood it is Showmanship That Counts and Mr. Olesen Knows His Theatrics



ABOVE: *Exterior flooded at night. The building is set back from the street, with a lawn and electric fountain in front of it. A large parking space for customers is a special feature next to the building*

RIGHT: *At the rear corner of the main floor is a model kitchen for floor demonstrations of equipment. It is on a slightly raised platform. Here range, water heater, dishwasher and refrigerator are demonstrated. This is in addition to the model kitchen upstairs*

LEFT: *General view of the south half of the display floor. The lamp merchandiser at right is close to the door. Showcases for small appliances form a square at center. At the rear (right) are the small parts and sundries counters with lighting unit racks above. An office space is at the rear, and with its own driveway from a side street is a large stockroom of wiring supplies, radio and appliance repair departments, and merchandise stock*

RIGHT: *A typical special floodlighting job, announcing a new automobile showroom or new car model. Loudspeakers are mounted on the roof, eight or ten arc lights flood the front, and a big searchlight at the right is being played back and forth across the sky. A large room apart from the main merchandise display on the main floor is devoted to the showing of this special lighting equipment alone*

News of the Industry

Merging of Three California Companies Awaits Railroad Commission Approval

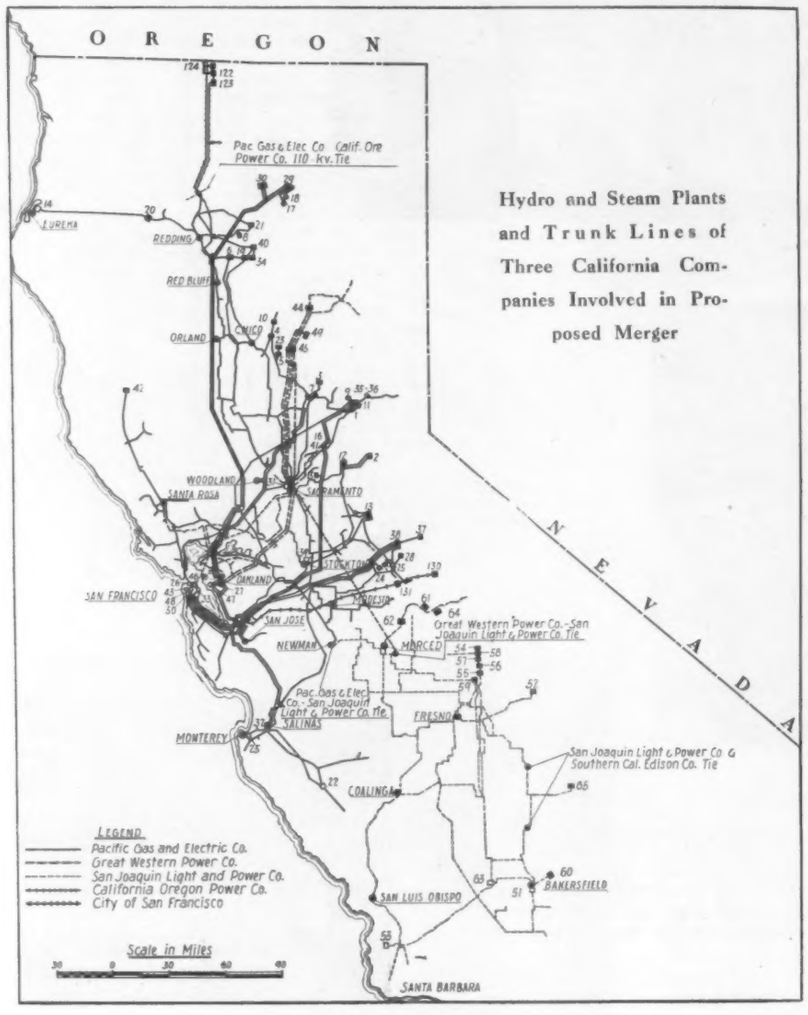
THE Pacific Gas and Electric Company on March 29 entered into an agreement with The North American Company, New York, for the acquisition of all of the latter's public utility interests in the State of California, giving in exchange therefor 1,825,000 shares of its common stock. This agreement has been approved by the boards of directors of both companies and now awaits only the approval of the Railroad Commission of the State of California.

Under the terms of the agreement, The North American Company undertakes:

1. To transfer to the Pacific Gas and Electric Company $43,886,700 par value of the common stocks of the Great Western Power Company of California, San Joaquin Light & Power Corporation and Midland Counties Public Service Corporation, representing all of the issued and outstanding common stocks of these companies except a small minority interest of $113,300 par value of the San Joaquin Light & Power Corporation. With these stocks, control of the Feather River Power Company, California Electric Generating Company, Napa Valley Electric Company, and other minor subsidiaries, likewise passes to the P.G. and E. Company.

2. To transfer to the P.G. and E. $4,606,100 par value of 7 per cent preferred stock and $146,200 par value of 6 per cent preferred stock of the San Joaquin Light & Power Corporation and Midland Counties Public Service Corporation.

3. To cancel all advances made up to Feb. 1, 1930, by The North American Company to its California subsidiaries for construction purposes. These ad-



Hydro and Steam Plants and Trunk Lines of Three California Companies Involved in Proposed Merger

Installed Plant Capacity of Plants Referred to by Number in Map

Pacific Gas and Electric Co.

No.	Power House	Capacity (Kva.)
1	Alta	2,000
2	American River	6,105
3	Bullard's Bar	8,125
4	Centerville	6,400
5	Coal Canyon	1,000
6	Coleman	16,500
7	Colgate	15,575
8	Cow Creek	1,500
9	Deer Creek	6,875
10	De Sabla	13,000
11	Drum	55,000
12	El Dorado	25,000
13	Electra	20,000
14	Eureka, Sta. "B"	9,000
15	Folsom	3,750
16	Halsey	12,500
17	Hat Creek No. 1	12,500
18	Hat Creek No. 2	12,500
19	Inskip	6,000
20	Junction City	1,970
21	Kilarc	3,000
22	King City	75
23	Lime Saddle	2,000
24	Melones	27,000
25	Monterey	1,000
26	North Beach	27,000
27	Oakland, Sta. "C"	62,000
28	Phoenix	1,875
29	Pit River No. 1	70,000
30	Pit River No. 3	81,000
31	Sacramento, Sta. "B"	17,500
32	Salinas	300
33	San Francisco, Sta. "A"	140,000
34	South	4,000
35	Spaulding No. 1	8,000
36	Spaulding No. 2	3,750
37	Spring Gap	7,500
38	Stanislaus	34,000
39	Stockton, Sta. "B"	1,500
40	Volta	7,000
41	Wise	12,500
	Total	756,300

Great Western Power Co.

43	Bush	2,000
44	Caribou	66,600
45	Las Plumas	65,000
46	North Beach	16,000
47	Oakland	10,500
48	Phelan	1,500
49	Bucks Creek	50,000
50	San Francisco	43,750
	Total	255,350

San Joaquin Light & Power Corp.

51	Bakersfield	26,550
52	Balch	33,000
53	Betteravia	2,500
54	Crane Valley	1,000
55	Crane Valley No. 1	16,000
56	Crane Valley No. 1A	425
57	Crane Valley No. 2	3,000
58	Crane Valley No. 3	3,750
59	Kerckhoff	42,600
60	Kern Canyon	10,600
61	Kittredge	375
62	Merced Falls	500
63	Midway	25,000
64	Mountain King	350
65	Tule	26,000
	Total	171,650
	Total capacity of three companies' plants	1,183,300

vances aggregate $19,180,781, and have been carrying 6 per cent interest.

The aggregate par value of the foregoing stocks and advances is $67,819,781, against which the par value of Pacific Gas and Electric Company common stock to be issued will amount to $45,625,000. The consolidation will, therefore, result in a substantial reduction of outstanding capitalization.

The various properties which will pass under control of the P.G. and E. Company if the agreement with The North American Company is finally consumated had outstanding on Dec. 31, 1929, in the hands of the public $88,813,850 par value of bonds and $37,384,900 of preferred stocks. These preferred stocks are widely distributed among approximately 25,000 investors, of whom 95 per cent live in California, mainly in the territory served by the companies.

It is anticipated that Pacific Gas and Electric Company, following its past policy of keeping its corporate, financial and operating structures as simple as possible, will in due time acquire the fee-title to all the properties involved in the present transaction. This would involve the retirement of the $37,384,900 of preferred stocks. While no definite plans have been worked out, it is quite likely that the retirement will be effected by offers of exchange for Pacific Gas and Electric Company preferred stock.

Through this transaction, The North American Company becomes the largest single stockholder of Pacific Gas and Electric Company, with the ownership of approximately 20 per cent of all of the latter's outstanding common and preferred stocks, both of which have voting power, and approximately 32 per cent of its outstanding common stock. These percentages are based on the present outstanding capitalization of the P.G. and E. Company. Upon conversion of the preferred stocks above referred to, The North American Company's representation will be about 17 per cent of total stock.

The consolidation of the California properties of The North American Company with those of the Pacific Gas and Electric Company would give California one of the largest interconnected power systems under single ownership in the United States.

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Key to World Progress Traced to Electrical Development at Arizona Joint Convention

STRIKING the keynote of the fifth annual convention of the Arizona Utilities Association, held in conjunction with the Pacific Coast Electrical Association and the Pacific Coast Gas Association in the Arizona Biltmore Hotel, Phoenix, Ariz., April 16 to 19, E. B. Criddle, president of the P.C.E.A., pointed out in his paper, "Milestones of Progress," the almost incredible growth of the electrical industry within the last eight years. He showed that electricity was indispensable to modern life and that its manufacture and distribution was the key industry of the world. He traced the progress of the industry, from its beginning in 1879, with 624 hp. available, to the present with more than 29,000,000 hp. developed and $11,000,000,000 invested.

One hundred and ninety delegates registered for the convention, including men and women from Los Angeles and San Francisco. The Arizona Biltmore's undulating golf course, the fairways of which are studded with giant saguaros, attracted many of the convention delegates before and during the official golf tournament. The Central Arizona Light and Power company's recently completed $2,500,000 steam power plant, four miles west of Phoenix, also drew many of the delegates in their spare hours.

A. F. Morairty, assistant general manager of the Central Arizona Light and Power Company, was elected president of the Arizona association, succeeding L. V. Seares. J. P. Sexton, manager of the Douglas (Ariz.) Arizona Edison branch, was chosen first vice-president, and C. H. Webber, superintendent of gas distribution of the Tucson Gas, Electric Light and Power Company, was named second vice-president. J. S. Arnold, Central Arizona Light & Power Company, was reelected executive secretary.

Directors elected were A. N. Jones, Superior, Ariz.; Willis P. Johnson, Yuma; L. V. Seares, Prescott; and George T. Herrington, Flagstaff.

The 1931 convention is to be held in Phoenix with W. C. Hornberger, vice-president and general manager of the Arizona Edison Comany, as host.

Winners in the official golf tournament were: A. E. Hitchner, Los Angeles; E. H. Jones, Los Angeles; C. M. Mackey, El Paso; and G. T. Luther, of Tucson.

Arthur Shackelford, of the Tucson Gas, Electric Light & Power Company, won first place in the state oratorical contest among utility company employees, and will be sent to Los Angeles to compete against other Western winners in a sectional elimination contest to be held on May 2.

The convention opened with the president's annual addresss given by L. V. Seares, vice-president and general manager, Arizona Power Comany, Prescott. In the afternoon of the opening day, Miss Gladys Price, director, Home Service Department, Central Arizona Light & Power Company, spoke on "Home Service—Its Value." Miss B. Edna Galvin, home economist, Edison General Electric Appliance Company, Ontario, Calif., followed Miss Price with a talk on "Electric Cooking Development." C. C. Cragin, general manager of the Salt River Valley Water Users' Association, gave as his paper, "Co-ordination of Power Development and Farm Electrification."

The second day's program of papers included the following: Captain A. E. Higgins, field representative, American Gas Association, "Sales Psychology and Advertising"; C. H. Webber, "Gas House Heating"; William M. Henderson, superintendent gas distribution, Los Angeles Gas and Electric Corporation, "Follow Through"; R. E. Fisher, vice-president, Pacific Coast Gas Association, San Francisco, "The Royal Road to Sales"; W. L. Frost, general commercial manager, Southern California Edison Company, Los Angeles, "Foundations for Load Building"; and in the afternoon: J. E. Lauderdale, district manager, Curtis Lighting, Inc., Los Angeles, "Brighter Show Windows —Bigger Profits"; and D. L. Scott, manager publice relations, Los Angeles Gas and Electric Cororation, "Introducing Joseph."

On the third day, Friday, the speakers included: E. B. Criddle, "Milestones of Progress"; K. W. Kissick, General manager, Deming Ice and Electric Company, Deming, New Mex., "Development of Irrigation Districts"; G. C. Tenney, editor, ELECTRICAL WEST, San Francisco, "Reviewing our A.B.C.'s"; and R. W. Turnbull, Pacific Coast district manager, Edison General Electric Appliance Company, "Merchandising."

Election of officers comprised the principal part of the last day's session. Miss Jean D. Roberts, of Tucson, chairman of the women's committee, gave a report on "Women's Committee Work."

The grand finale to the convention was a Western barbecue, staged at the back of the Arizona Biltmore, followed by a rodeo.

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McGraw-Hill Co. of Calif. Appoints New Officers

Reorganization of the McGraw-Hill Company of California, publisher of ELECTRICAL WEST, made necessary by the death of C. T. Hutchinson last February, establishes Edgar Kobak as president. Mr. Kobak is vice-president and general sales manager of the McGraw-Hill Publishing Company, Inc., of New York. Other officers of the California company include Nathan A. Bowers, vice-president and general manager; George C. Tenney, vice-president; and Howard C. Worden, secretary and treasurer.

ELECTRICAL WEST will continue to be under the direct supervision of Mr. Tenney as editor.

James H. McGraw remains as chairman of the board; the other directors consist of the four officers named above.

Oregon Commission Would Oust City's Rate Experts

Denying that the engineering firm of Carey & Harlan had aught to do with the reduction of industrial power rates in the City of Portland, Ore., the Public Service Commission has advised the municipality to forego the further employment of these independent engineers to investigate utilities matters in that city and thus save an expenditure of approximately $20,000 by assigning the work to the regular department of engineering maintained by the public.

The commission further went on record as being opposed to a plan suggested by Governor Norblad whereby the engineers employed by the commission would work in conjunction with the firm of Carey & Harlan in a proposed valuation investigation to be undertaken by the city in connection with electric street railway rates and charges. The commission stated its willingness, however, to lend the state employees to the municipality providing the investigation be assigned to the city engineer.

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Work on Diablo Dam to Be Finished in September

The Diablo dam, built to impound water to operate the new hydro-electric power plant which the City of Seattle is constructing on the Skagit River at Diablo, is expected to be completed next September, Winston Brothers, contractors, have announced. Completion of the dam will absorb virtually one-half of an appropriation of $13,500,000 approved by the city council to finance a five-year development program. It will enable the city to operate to capacity its present Gorge Creek power plant, a few miles down the river from Diablo, while waiting for the new Diablo plant, J. D. Ross, city light superintendent, says. Two electric generators for the new Diablo power house, and the water turbines to operate them, rated at 85,000 hp. each, were ordered recently for delivery early next year. These will double the City Light's present production of electricity. Bids for construction of the power house will be called soon. With its equipment, it is estimated to cost between $3,000,000 and $3,250,000.

The power tunnel, through which water will be brought to this plant, soon will be finished at a cost of about $750,000 under a separate contract made with Rumsey and Jordan. Construction has already been started also on a complete new transmission line, to extend from Diablo into Seattle, at an estimated cost of $2,800,000.

Plans are being made to follow completion of the Diablo development with construction of a control dam at the junction of Ruby Creek and the Skagit River, about six miles above Diablo. This would form a reserve lake about 27 miles long, reaching almost to the Canadian border.

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RAISES FISH TO REPLACE HYDRO PLANT'S TOLL—The City of Eugene, Ore., is constructing a $10,000 fish hatchery which is to be maintained and operated in connection with a new hydro-electric generating plant just completed by the municipality. The hatchery will be of such capacity as to insure the propagation of a sufficient number of fish to replenish the supply in the McKenzie River, should the operation of the hydro plant destroy or reduce game fish life.

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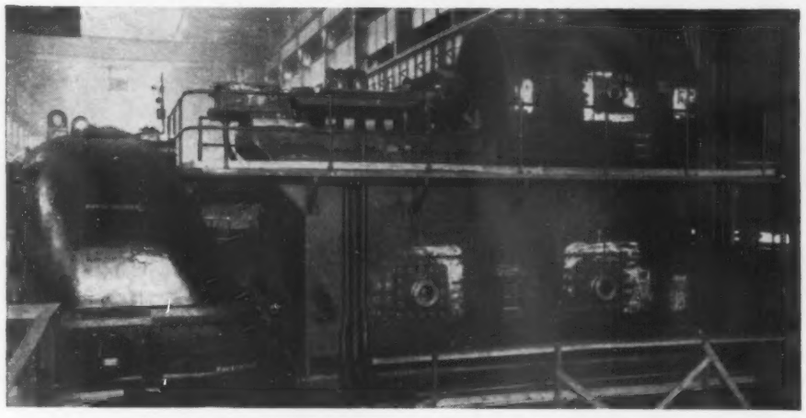
New Type of Turbine for P.G. and E. Steam Plant



FIRST of two turbine generators being erected at the Schnectady Works of the General Electric Company for Station "A" of the Pacific Gas and Electric Company in San Francisco. The picture shows the 1,200-lb. high-pressure turbine and generator mounted on top of the generator of the low-pressure element. The generators will have a rating of 50,000 kw. at 80 per cent power factor. The first unit is scheduled for operation by Oct. 1, 1930.

Eugene, Ore., to Build Own Steam Plant

Decision to build a 6,000-kw. steam plant for standby service for the City of Eugene, in lieu of the contract now held with the Mountain States Power Company for such service, which expires this year, has been announced by the Eugene Water Board.

The plant, which is to cost approximately $400,000, will be designed to burn oil, but boiler room arrangement will be such that hogged fuel may be substituted if it appears desirable in the future to use the plant to deliver auxiliary power to the system, though such use is not immediately contemplated. The plant will be located on the bank of the Willamette River on property adjacent to that now used by the city for its water filtration plant and electric substation.

Stevens & Koon, consulting engineers, Portland, have been commissioned to prepare the plans for the plant, which is scheduled for operation by the end of 1930.

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Final N.E.L.A. Convention Plans Taking Shape

A preliminary program for the fifty-third convention of the National Electric Light Association, to be held in San Francisco June 16-21, has been worked out and final arrangements for handling the large number of delegates expected to attend are being made by the several convention committees on the Pacific Coast, and the transportation committee, whose representatives are at work in all sections of the country.

All business sessions as well as evening entertainment will take place in the Exposition Auditorium at the Civic Center, and time schedules will be strictly adhered to. While there will be no manufacturers' exhibits at the convention, there will be a number of instrucive section, bureau, committee and N.E.L.A. headquarters exhibits in the Polk and Larkin St. halls of the Auditorium.

A convention daily newspaper will be published by the editorial staffs of ELECTRICAL WEST and *Electrical World.*

To avoid the confusion that has existed at previous N.E.L.A. and P.C.E.A. conventions through the receipt of applications for membership during the period of registration for the convention, the following plan for handling the situation has been announced by E. B. Criddle, president of the P.C.E.A.

All applications for individual membership made during the convention period must be accompanied with the regular non-member registration fee of $5. Should investigation after the close of the convention establish the eligibility of the applicant for membership, the excess payment of $2 will be either credited to his 1931 dues or returned to him, as he may elect.

A.I.E.E. Convention Plans Well Under Way

Well advanced plans for an instructive and entertaining Pacific Coast convention of the American Institute of Electrical Engineers, to be held at Portland, Sept. 2-5, 1930, have been announced by H. H. Schoolfield, Pacific Power & Light Company, chairman of the general convention committee, which has been functioning for the past five months. Five technical sessions, two student branch sessions, and a conference on student activities by the counselors' committee from districts 8 and 9 are scheduled on the business program, while ample provision is being made for recreation and entertainment.

A wealth of material from which to choose papers for discussion in the technical sessions has been unearthed by the program committee in charge of H. H. Cake, General Electric Supply Corporation. These discussions, which will range from the extremely practical to the more theoretical realm of pure research, fall into four general classifications: Transmission and distribution, power station development, communication, and research. Specific subjects of papers already scheduled for persentation are forecasting precipitation, mercury arc rectifiers, corona tests, porcelain insulator research, and power company communication systems.

An informal reception and dance, the annual golf tournament for the J. B. Fisken, cup, followed by an informal banquet at the country club, are the major features of the entertainment program being arranged by C. W. Fick, General Electric Company, chairman of the entertainment committee, and R. J. Cobban, Westinghouse Electric & Manufacturing Company, golf committee chairman. Plans are being made to secure for the golf tournament the course of the Portland Golf Club. The ample facilities afforded by the new club house at that course will make an excellent setting for an informal banquet and dance on the evening of the tournament.

In charge of E. F. Pearson, Northwestern Electric Company, a number of trips of diverse interest are being planned. A trip to the Oak Grove development of the Pacific Northwest Public Service Company on the Clackamas River, where a second generating unit is being installed, and another to the Northwestern Electric Company's hydro-electric development on the Lewis River, where dam construction will be in full swing, are expected to offer considerable appeal.

Entertainment for the ladies will be in charge of Mrs. A. S. Moody, wife of the Northwest manager of the General Electric Company, who is making plans that will keep the visiting wives agreeably occupied at luncheons, teas and bridge at some of the many beauty spots in and around Portland.

Convention headquarters will be established in the Multnomah Hotel where business sessions will be held.

The following have been selected from the general convention committee to head subcommittees which will handle the various convention activities: Program, H. H. Cake, General Electric Supply Corporation; golf, R. J. Cobban, Westinghouse Electric & Manufacturing Company; entertainment, C. W. Fick, General Electric Company; finance, A. S. Moody, General Electric Company; hotel, A. K. Morehouse, The Pacific Telephone and Telegraph Company; transportation, C. P. Osborne, Pacific Northwest Public Service Company; publicity, Berkeley Snow, ELECTRICAL WEST; reception, J. E. Yates, Pacific Power & Light Company; registration, A. H. Kreul, Pacific Northwest Public Service Company; trips, E. F. Pearson, Northwestern Electric Company; ladies' entertainment, Mrs. A. S. Moody.

Save the Next Issue!

ON MAY 15 ELECTRICAL WEST will publish its annual issue devoted to reports of sections and committees of the Pacific Coast Electrical Association.

In previous years these reports have reappeared in the published proceedings of the association. This year no Convention Proceedings will be issued. ELECTRICAL WEST'S May 15th number, therefore, should be retained for reference, as it will be the one and only published account of the work of the sections and committees for the year past

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WOULD GIVE SEATTLE CITY LIGHT ITS OWN ENGINEERS—In keeping with suggestions made in a recent report of J. D. Ross, city lighting superintendent, Seattle, concerning reforms needed by his department, Councilman Otto A. Case has prepared a measure to give the municipal power and light organization jurisdiction over its own engineering work. Under present arrangements, the city engineer has control of all such activities for all municipal divisions and enterprises. Mr. Ross advised Mayor Frank Edwards and the city council, in connection with the efficiency survey for his department, that considerable time could be saved on the development program mapped out for City Light, and that various phases of the work could be better co-ordinated if his department had its own engineers. The Case measure is expected to divide the council and precipitate vigorous debate.

Civil Service Examinations for Hydro Engineers

The United States Civil Service Commission announces the following open competitive examinations:

Principal hydro-electric engineer, $5,600 to $6,400 a year.

Senior hydro-electric engineer, $4,600 to $5,200 a year.

Hydro-electric engineer, $3,800 to $4,400 a year.

Associate hydro-electric engineer, $3,200 to $3,700 a year.

Assistant hydro-electric engineer, $2,600 to $3,100 a year.

Applications for these positions must be on file with the Civil Service Commission at Washington, D. C., not later than May 7, 1930.

The examinations are to fill vacancies occurring throughout the United States in the Engineer Department at Large, War Department, and in positions requiring similar qualifications. Higher-salaried positions are filled through promotion.

Competitors will not be required to report for examination at any place, but will be rated on their education, training, experience, and fitness.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C., or from the secretary of the United States Civil Service Board of Examiners at the post office or customhouse in any city.

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Flathead Power Project Up for Discussion Again

The Flathead, Montana, power project has been up recently before the Senate Indian Affairs Committee with W. H. Wheeler pressing his claim for permit and charging government officials with bias in favor of his rival, the Rocky Mountain Power Company, a Montana Power Company subsidiary. Senator Burton K. Wheeler, solicitous toward his redskin constituents on the Flathead Reservation, directed skeptical questions at the financial ability of the witness.

Mr. Wheeler was able to show that several large companies are interested in the possibility of building up an electro-chemical industry which would call for full development at the project. He claimed that the Montana Power Company would develop only part of the available capacity and, having other sites along the river, would have a regional monopoly. It was also stated that the Indians would get a better deal under Mr. Wheeler's plan. W. H. Rollins & Sons were named as the financial backers. Mr. Wheeler and other witnesses claimed that government officials had discriminated against his bid and had ignored charges involving the debauchery of Flathead Indians, and other accusations. Most of the testimony was similar to that previously offered before the Federal Power Commission.

Public Ownership Measures on Fall Ballot in Oregon

At a primary election to be held in Oregon on May 16 the electorate will be asked to support the nominations of three Republican candidates for governor whose respective platforms recommend public ownership of hydro-electric utilities, the right of municipalities to bargain for utilities service, and the abolition of the office of Public Service Commission.

There is also in circulation for signatures an initiative petition providing for such necessary amendments to the state constitution as will repeal all sections of the laws which operate to create and maintain the utilities' regulatory department. This petition will appear on the November ballot. Should Oregon's commission be abolished as proposed, the public would be left with but one source in the matter of regulation, that being the Legislature which convenes every two years.

The last time the people of Oregon were invited to express their will in regard to public ownership and operation of electric utilities was in 1926, and at that time the citizens refused to sanction a proposal for placing the state in the electric business by a vote of 147,092 to 35,313.

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TACOMA BUYS STEAM PLANT SITE—The City Council of Tacoma has authorized the purchase of a 6¾-acre site on Hylebos Waterway near East 11th St. to be used by the Light Division of the Department of Public Utilities as the site of the new municipal steam plant.

A Birthday and a Record

FROM 712 ranges to 9,176 ranges in eight years! The celebration in his office on April 12 that marked the birthday of John W. Wrenn also signalized the remarkable gain in range sales that has been made since he joined the Great Western Power Company of California in 1922. The mammoth cake that Mr Wrenn is shown in the act of cutting for those who attended his surrise birthday party, bore an excellent sugar replica of an electric range as well as the figures that told the story of the progress made since he became manager of electric range sales for the company. The birthday celebration was held in Mr. Wrenn's offices at 447 Sutter St., San Francisco.

$21,500,000 Added to Price of San Francisco Systems

A bond issue of $21,500,000 must be approved for necessary building extensions in addition to $63,545,000 that must be voted by the people of San Francisco at the August 26 primaries if the city is to acquire the local electrical distribution systems of the Pacific Gas and Electric and Great Western Power Companies, according to a report submitted last month by City Engineer M. M. O'Shaughnessy to the Board of Public Works.

"The mere acquisition of these properties will not permit the municipality to distribute the energy now being generated on the Hetch Hetchy project," the report states. "This will require to distribute the nergy now being gen the extension of the Hetch Hetchy transmission line from the south end of San Francisco Bay near Newark into San Francisco, and the construction and acquisition of additional property and facilities within the city to connect up and make operative the properties acquired for the distribution of energy when separated from the other operating facilities of the companies."

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BIDS CALLED FOR COMPLETION OF CENTRALIA'S PROJECT—Bids were received by the City Commission of Centralia, Wash., on April 29 for completion of the city's hydro-electric project on the Nisqually River. The work is estimated to cost $400,000, and will be the final step in the building of the $1,000,000 plant.

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Power Company Opens Store in All-Electrical Village

THE tenth district office and Electrical Happiness Store recently opened by the San Diego Consolidated Gas & Electric Company in the hotel building at 112 Avenida del Mar, San Clemente, Calif., is in complete harmony with the architecture that has been adopted for all buildings in this "100 per cent electrical city." Miss Dorothy Latham, a resident of "Ole Hanson's Spanish Village," has been placed in charge of the store under the supervision of George A. Ferguson, district agent of a territory that embraces San Clemente and San Juan Capistrano

FINANCIAL NEWS

Pepco Stockholders Offered Holding Company Shares

Local holders of preferred stock of the former Portland Electric Power Company, now the Pacific Northwest Public Service Company, Portland, are being offered in exchange the class A stock of the Central Public Service Corporation, owner of the Pacific Northwest company. The exchange, while not compulsory, is being urged through the company's investment department, in charge of E. G. Jarvis. Exchange values of the various preferred issues of Pepco are established at $105 for the 7 per cent prior preference issue and for the 7.2 per cent first preferred, and $100 for the $6 first preferred. The class A stock of the Central Public Service Corporation, which is a $4 cumulative no par preferred, is valued at $57.

The offer has been made through Albert E. Pierce & Company, Chicago, which operates the securities department of the Central Public Service Corporation and which has established a local office for auditing purposes in the American Bank Building, Portland.

The investment department of the Pacific Northwest Public Service Company has discontinued offering Pepco stocks and is selling to customers, through employees as formerly, the class A stock of the Central Public Service Corporation. Nominal commissions are paid to employees for such sales, ranging from 50 cents a share to $1 a share, depending on the number of shares sold.

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Two California Utilities Increase Net Earnings

Net earnings of the Pacific Gas and Electric Company and the Great Western Power Company of California for 1929 show considerable increase over the previous year in the recently issued annual reports of the two companies.

The P. G and E. Company reports the most satisfactory earnings in its history for the year ended Dec. 31, 1929, showing gross operating revenues of $64,440,588 as compared with $61,449,592 for the preceding year, an increase of $2,990,996. Net balance after all charges, including $4,840,565 dividends on preferred stock, amounted to $10,899,921, equivalent to $3.52 per share on the average number of shares of common stock outstanding during the year, and to $3.27 per share on the number of fully paid shares outstanding at Dec. 31, 1929. This compares with a balance of $8,800,708 after similar deductions in the preceding year.

Surplus before payment of preferred dividends amounted to $15,740,486, an increase of $2,338,148 over the 1928 figure. Dividend requirements on preferred stock were earned 3.25 times, the report shows.

Net earnings of the Great Western Power Company and its subsidiaries for the year reached a total of $2,904,103 after all charges, including depreciation and taxes and other reserves, equivalent to more than twice the dividend requirements of approximately $1,420,000 on the preferred stock issues outstanding in the hands of the public, according to the company's report.

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B. C. Power Corp. Bonds Issued—An issue of $10,000,000 of B.C. power Corporation, Ltd., 5½ per cent first refunding and collateral trust sinking fund gold bonds is being offered jointly by Nesbitt, Thompson & Company, Ltd.; Wood Gundy & Company, Ltd.; and Andrew Holt & Company. The bonds are classified as Series A, dated March 1, 1930, and reach maturity March 1, 1960. The bonds are being offered to the public at $98 and accrued interest, to yield more than 5⅝ per cent. Proceeds of this issue will be used in connection with the B. C. Electric Railway Company's Ruskin and Bridge River developments.

Colorado Company Reports $1,216,366 Revenue Gain

Confirming the statement, made earlier in 1930, that a great surge of new business in 1929 necessitated a budget of more than four and one-half millions for immediate improvements and rehabilitation, the Public Service Company of Colorado's 1929 financial report, just issued, shows a gross operating revenue of $13,056,914 as compared with $11,840,548 the preceding year.

Reduced to net figures, 1929 disclosed income of $5,611,185.86 as compared with $4,927,460 in 1928. Surplus, as of Dec. 31, 1929, was $5,243,913, an increase of more than $1,500,000 during a twelve months' period.

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Appropriation Asked for City's Transmission Line Clearance—J. D. Ross, superintendent of lighting, Seattle, has asked the city council to appropriate $250,000 to pay for clearing the right-of-way for the new electric transmission line which will carry power into Seattle from the city's hydro-electric development at Diablo on the Skagit River. This would be in addition to an appropriation of $195,000 approved by the council a few days ago to acquire the new right-of-way over the east slope of Beacon Hill. Mr. Ross says that $175,398.84 has already been spent out of the City Light fund for clearing operations, and that about $10,000 a month is being spent for that purpose.

Pacific Coast Electrical Association

Aspects of Colorado River Problems Explained to Engineers

"THE COLORADO RIVER problem," as lucidly discussed by W. C. Mullendore, vice-president of the Southern California Edison Company, was undoubtedly the item of greatest general interest presented at the Fresno conclave of the Engineering Section, April 16-18. The occasion was a luncheon gathering attended by some 175 members of the Engineering and the Purchasing and Stores Sections, and several visitors.

As emphasized by the speaker, hydro-electric power from the Colorado River is expensive power, even under the most favorable conditions possible by the terms of the Congressional Act which authorizes construction. With the price of 0.163 cent per kw.-hr. delivered at the proposed power house bus, the minimum cost delivered at Southern California load centers would be at least 0.4 cent, a cost well in excess of equivalent power delivered from local steam-electric generating plants. Thus the power is not the bonanza of popular tradition, but, instead, is a burden which electric utilities and consumers of electric energy must help to bear in order to make possible the benefits of flood control and water conservation.

Inseparably intermingled in the project are the forces of economics, engineering and politics, each of which must be accorded due recognition. The speaker stated that the power contract required by Congress very soon would be completed and ready for presentation to that body for ratification. This done, it is conceivable that actual preliminary construction work could be started in 1931, provided Arizona does not throw the matter into extended litigation.

All committees of the Engineering Section completed final reports which will appear in the May 15 issue of Electrical West, and got well started on next year's program of studies and investigations. Thus the work will proceed without interruption.

A brief resumé of the activities of each of the various committees at the Fresno meetings, as reported by the chairmen, is given in the following paragraphs:

Accident Prevention Committee

J. R. ROWE

Los Angeles Gas and Electric Corporation, Chairman

Many members of other committees attended the sessions of the accident prevention committee and contributed thereto. One of the most important efforts during the past several months has been the effort to find ways and means of arousing interest and activity among company officials and men in supervisory capacities whose attendance at accident prevention committee meetings would greatly increase their value, and whose co-operation in promoting safe practices is essential if success is to be attained. Further attention was given to this subject at Fresno.

Several specific subjects have arisen from the round-table discussions at the quarterly meetings which lend themselves to definite investigation and written reports.

Rubber glove testing has been gone into again carefully to determine the most efficient methods and schedules of testing, considered both as to safety and as to economy in glove replacement. This subject is under study and will be reported upon with substantiating data at a later date.

Several machines recently have been placed on the market to replace manual methods of performing artificial respiration for the resuscitation of victims of electric shock. After a trial and investigation of these machines, this committee has refused to recommend their use, since they are considered inferior to the manual method used at present.

Since the January meeting an Insull medal has been presented to C. E. Seymour of The Southern Sierras Power Company for successfully resuscitating a fellow worker from the results of electric shock. C. T. Mess, of the State Railroad Commission, presented an interesting report of serious and fatal accidents for the first period of the year 1930, showing a decrease in comparison with last year's figures. E. F. Pearson, representing the Engineering Section of the Northwestern Electric Light and Power Association, visited the meeting.

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Electrical Apparatus Committee

H. L. SAMPSON

Southern California Edison Company, Chairman

In connection with the final report on transformers and regulators, it was brought out that in several widely separated districts in California, sludging within transformers has resulted in radio interference. This has been found to occur both in station-type and distribution-type transformers, and it was the opinion of those reporting the trouble that investigation of radio complaints resulted in the alleviation of potential transformer failures.

Various troubles with rotating machinery were commented upon in the final report of the subcommittee on synchronous condensers. Many of these troubles show that manufacturers originally had the idea that the same design worked out for relatively small condensers could be applied to much larger machines. However, operating experience has shown that large machines require improved design to remove many of the operating difficulties. This improvement is beginning to show in the newer designs. A discussion of hydrogen-filled outdoor condensers aroused much interest and discussion.

In the report covering utilization equipment, it was recommended definitely that utility managements take a stand against high starting currents on electric motors in spite of the manufacturers' attitude to the contrary. The committee recommended that motor-starting currents should be held down to those specified in the 1923 N.E.L.A. rules, but was willing to permit an advance of 25 per cent above the 1923 rules for starting currents in motors of more than 40 hp. This latter concession was recommended in the interest of co-operation.

In the report covering control equipment and layout, it was emphasized that at last, after great effort, there is a general tendency toward recognizing the importance of these necessary items of station design. It was unqualifiedly recommended that the selection and layout of control equipment should be recognized as a major item of design, instead of being considered as merely one of the auxiliary items. Attention is being given to the use of lead-covered cable for control circuits. There seems to be a trend toward lead-covered cable and a trend toward the use of ducts of material other than metal.

Hydraulic Power Committee

CLINTON deWITT

Taper Tube Pole Company, Chairman

Reports discussed at the Fresno meeting included those on the following subjects:

1. Automatic and regulatory hydraulic safety devices—E. A. Crellin, chairman.
2. Use of concrete in hydraulic structures—C. P. Vetter, chairman.
3. The mechanical reliability of hydro-electric plants—D. P. Dinapoli, chairman.
4. Flow line conduits—J. W. Jourdan, chairman.
5. Maintenance of hydraulic works—J. M. Gaylord, chairman.
6. Current research and practice in hydro development—R. M. Peabody, chairman.
7. Automatic frequency control in hydro-electric plants—Lloyd F. Hunt, chairman.
8. Hydraulic plant operating problems—L. G. Roberts, chairman.

Particular attention was devoted to Mr. Roberts' report and to ways and means of stimulating the co-operation of operating men in order that hydraulic design might profit more fully by operating experience.

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Meter Committee

J. C. ABEL

Pacific Gas and Electric Company, Chairman

Education of meter men was the first subject for discussion at this meeting. The course in the south was held March 24-28, with an attendance of 38, 22 taking the advanced course and 16 the elementary course. The Berkeley course will be held May 12-17. The Arizona course has been postponed until fall. C. L. Corey, of the University of California, Berkeley, gave a short talk on the courses held so far at Berkeley. There was quite a discussion on the correspondence course put out by the National Electric Light Association.

The final report on meter statistics was read and it is believed that this subject now has been thoroughly covered. The subject of special tests and investigations always is a live one, and it will be carried over next year. Since a complete study of test facilities has been carried on for the last ten years it was deemed advisable to drop this subject next year.

Other subjects given consideration were test problems of watt-hour meters, operating problems of meter departments, investigation and tests on relays, and special tests and investigations.

Some new subjects for next year's work were discussed, but no definite program has so far been arranged.

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Inductive Co-ordination Committee

H. S. LANE

Pacific Gas and Electric Company, Chairman

H. N. Kalb, reporting for the subcommittee on inductive co-ordination, ably presented a report on a current case of inductive co-ordination involving an exposure exceeding forty miles in length between a certain 11-kv. power line and a telephone line in the San Joaquin Valley. Extreme irregularity of coupling between these circuits rendered the usual co-ordination (by studied transposition of both power and telephone lines) insufficient for satisfactory communication service. Analyses showed the principal component of the telephone noise to be a prominent ninth harmonic, which was reduced by a specially designed wave trap.

A report of the committee on power company communication systems showed no progress to have been made in the standardization of equipment used in the power company communication systems of P.C.E.A. member companies. Similarly no progress along this line is apparent in the national committee. Telephone companies are soliciting the communication business of the Eastern power companies, apparently with better success than here, probably because better facilities can be made available at more attractive prices where distances involved are not as great as on the Pacific Coast.

As to radio co-ordination, no definite recommendation has been made by the national committee regarding the establishment of a tolerable standard of noise field strength or signal-to-noise ratio toward which we should work. It is believed that the adoption of some standard noise level may soon be forced as a measure of protection against ill-advised legislation.

Mr. Kalb emphasized the rural problem and advocated that, due to the greater distances of the average rural listener from the broadcast stations on the Pacific Coast, the problem became correspondingly more acute, and he felt that it was up to this Section to take the lead in establishing standards.

In the report of the subcommittee on common neutral, was given the present status of thirteen trial areas in which permission to cut to common neutral under the trial practices has been granted by the Railroad Commission. Data received from the various power companies on the areas now cut over were outlined, as also was the present status of noise survey data to be submitted by the telephone company. These data, both power and telephone, are to be submitted as quickly as possible and a committee will go over them and make a suitable outline for the final reports to be submitted to the Railroad Commission.

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Overhead Systems Committee

F. E. DELLINGER

Los Angeles Gas and Electric Corporation, Chairman

Final reports of all subcommittees were presented for discussion. No new subject matter was added to the reports on transformer loading, as presented in January at the Los Angeles meeting. Likewise the report covering the national code was left in the same form as reported at Los Angeles.

The report on joint pole practice and construction rules carried the essential features of a multi-party joint pole contract. Appreciable discussion was aroused with respect to the joint use of anchors and advance joint planning by the co-operating utilities.

A progress report covered the common-neutral study up to date, but presented no definite information. The report on grounding aroused discussion concerning various methods of securing, testing and maintaining satisfactory grounds for electrical apparatus.

Additional data were added to the work on pole-line structures covering experimental protective treatment of several poles in different locations. These experimental intallations include chemical treatment.

The continuing study on operating records covers 12,780 cases of trouble, 77 per cent of which were on distribution lines and 23 per cent on transmission lines. A total of 107 different causes were listed for the 12,780 cases reported.

Corrosion of metals in line construction was reported upon briefly and discussion seemed to indicate a definite trend toward the general use of galvanized hangers for transformers. The subcommittee suggested that uniform standard specifications for hot-dipped galvanizing should be adopted by all utilities.

Conductor vibration experiences of member companies, as reported, constituted the subject of a report, together with different methods used to minimize or eliminate such undesirable conductor movement.

An interesting motion picture showed activities in replacing a pole in a "hot" 66-kv. line.

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Prime Movers Committee

H. S. MARKEY

Great Western Power Company of California, Chairman

Final reports in abstract form were read by the six subcommittee chairmen. These reports will appear in full in the May 15 issue of ELECTRICAL WEST, and their brief presentation at the Fresno meeting provided plenty of time for active discussion which was participated in by the 21 members and several visitors present.

Definite recommendations were made to the Review Committee concerning next year's work, and tentative appointments of subcommittee vice-chairmen for next year were considered.

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Underground Systems Committee

R. P. LUTZI

Pacific Gas and Electric Company, Chairman

An interesting program was presented by this committee covering three major subjects, as well as five abstracts of papers which have been under consideration by the national committee.

H. C. Moyer outlined the work which has

been undertaken by the subcommittee on pulling stress of cables, and the study of various duct materials. Interesting information has been obtained and tests have been made on the various duct materials. The effect of lubricants on pulling stresses of cables while being pulled through such ducts, as well as the effect of arcs caused by burning cables within the duct were discussed. The subject will be continued during the coming year.

A report describing the low-voltage a.c. network system as applied to a section of the distribution system in San Francisco, was prepared by P. E. Chapman. The system used consists of primary feeders from separate sources with the secondary main tied together through network protectors.

Temperature and its effect on cables in underground systems was widely discussed. Interesting facts were brought out regarding the safe loading of cables, also the effect on the lead sheath from elongation caused by the change in temperature not only in the ducts but the effect of the seasonal air temperatures.

The use of low-loss transformers was discussed, and from the data presented it appears they are valuable for use in manholes of limited radiating surface. Where transformer losses are considered, their use has economic advantages.

The use of parkway cable for rural and suburban distribution, while it is limited on this coast, has been gaining in favor in various localities, and no doubt will increase as the demand presents itself.

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Prize Winners Announced in Essay Contest

Results of the 1930 essay contest conducted by the Commercial Section, P.C.E.A., have been announced by Alfred May, chairman of the essay contest committee. The title chosen for this year's essays was, "Better Home Lighting and What I Can Do to Obtain It," and 1,512 power company employees competed in the contest.

First prize of $100 has been awarded to Howard W. Haynes, Southern California Edison Company, Los Angeles. Bena M. Chaney, San Diego Consolidated Gas & Electric Company, has been awarded the second prize of $75; W. A. Merritt, Southern California Edison Company, Whittier, third prize, $50; and George M. Megica, Los Angeles Gas and Electric Corporation, fourth prize of $25. Ten prizes of $10 and 25 prizes of $25 also were awarded, and in addition 50 contestants each received $5 in a drawing held after the prize winning essays had been chosen.

Entries in the contest were received from Feb. 15 to March 15. Richard E. Smith, Oscar L. Moore, Fred C. Foy, and Victor Hartley acted as the judges.

The following table indicates the number of employees in each company that participated in the contest:

	No. of Essays
Southern California Edison Co.	816
Los Angeles Gas and Electric Corp.	462
Pacific Gas and Electric Co.	54
Coast Counties Gas & Electric Co.	51
San Diego Cons. Gas & Electric Co.	50
The Southern Sierras Power Co.	40
San Joaquin Light & Power Corp.	23
Great Western Power Co. of California	13
Tucson Gas, Electric Light & Power Co.	3
Total	1,512

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ANNUAL MEETING DATE SET—The annual meeting of the Pacific Coast Electrical Association will be held in the Exposition Auditorium, San Francisco, at 10 a.m. Monday, June 16, 1930. The program will consist entirely of the reports of the president, secretary and treasurer, and the election of directors and officers for the administrative year 1930-1931.

SEMI-FINALS IN SPEAKING CONTEST TO BE HEARD MAY 2—Semi-finals in the public speaking contest conducted by the P.C.E.A. will be held in Los Angeles and San Francisco on May 2. At that time two speakers will be chosen from among the employees of companies in the southern part of the state and two will be selected at San Francisco from northern California companies. The two winners in each division will compete at Fresno on May 16 for the selection of a winner and an alternate to represent the P.C.E.A. at the national finals, to be held on Monday, June 16, the opening day of the N.E.L.A. convention, in the ball room of the Palace Hotel in San Francisco.

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Great Western Women Inspect Steam Plant

THE monthly luncheons of the women's committee of the Great Western Power Company, San Francisco, are being extended into trips afield. Two launches were chartered on March 25 to take members of the committee down the bay to the company's new San Francisco steam plant. The women are shown here on their long treck across the oil unloading pier, where the boats were tied up, to the steam plant on the shore. Details of the steam plant's operation were explained to the visitors by Ernst E. Behr, director of purchases of the company, and Fred Stillwaggon, plant superintendent.

Northwest Electric Light & Power Association

Largest Meeting of Its History Held by Engineering Section

A WEALTH of material for study and discussion was presented under the nine major committees of the Engineering Section at the seventh annual general meeting of that section of the Northwest Electric Light and Power Association at Aberdeen, Wash., March 26-28, 1930. The meeting was the largest yet recorded, there being over 160 registrations. Entertainment was afforded the delegates and their wives by the personnel of the Grays Harbor Railway & Light Company who acted as hosts, an enjoyable feature being a banquet on the second night of the meeting.

After a welcome from F. W. Loomis, president of the Aberdeen Chamber of Commerce, J. B. Fisken responded for the association, calling attention to the part being played by the engineers of the country in the Hoover construction program. Another speaker outside the regular committee programs was A. B. Campbell of the engineering staff of the N.E.L.A., New York, who discussed informally the work of the N.E.L.A. engineers with respect to various problems of national significance requiring the co-ordination of other interests with those represented by the N.E.L.A. Codes, inductive co-ordination, wood pole specifications, joint use, and airway marking and lighting were among the subjects covered by Mr. Campbell.

The major portion of the program was given over to a consideration of various subjects raised by the different committees, each of which was allotted a portion of the time. A resumé of the papers presented and the discussions thereon follows:

Underground Systems Committee

C. H. HOGE

Puget Sound Power & Light Company, Chairman

A complete discussion of the practices of the Pacific Northwest Public Service Company (Pepco) both as to construction and maintenance of ornamental street lighting systems was contained in a paper by G. L. Walker of that company, in which he concluded that considerable experimentation and research on some of the equipment used in such systems would be necessary to determine whether or not such equipment is entirely satisfactory. A discussion on many phases of construction and maintenance disclosed that most users of steel armored cable were not entirely satisfied with this equipment because of sheath losses and because the armor would not adequately protect the cable. The use of non-armored cable laid in sand and covered with plank or half tile was said to be satisfactory. The imperfections involved in present control equipment brought out the opinion that there was opportunity for development of

the photo-electric cell for regulating the on and off periods by light rather than by the clock.

The process by which an underground network is being developed in Salt Lake City was described in a paper by P. P. Ashworth and A. C. Kelm, Utah Power & Light Company. To provide initial cable capacity, the next step in the development proposes to group transformers in each individual substation into two single-phase banks, each bank being fed from the same phase of different 4,000-volt cables and with both banks connected through network protectors to the existing single-phase, three-wire, 120/240-volt system. From this system it will be a simple process eventually to change the secondary to a four-wire Y system. Questions brought out the economics involved and the steps being taken to acquire a complete automatic secondary network.

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Electrical Apparatus Committee

E. F. PEARSON
Northwestern Electric Company, Chairman

The economic problem presented by circuit breakers becoming obsolescent as a result of increased rupturing capacity requirements was briefly outlined for discussion by Joseph Hellenthal, Puget Sound Power & Light Company. The ways in which the problem could be solved by replacing or rebuilding the breaker or by cutting in current-limiting reactors on the circuits, and the difficulties surrounding the adoption of any of these means, were stated. General discussion brought out many additional difficulties encountered by the companies, some of whom had rebuilt obsolete breakers or installed reactors. The part played by manufacturers in assisting in the solution of the problem was told by C. W. Fick, General Electric Company, and C. E. Carey, Westinghouse company. Mr. Carey explained the substitution of the new Deion grid contact for the original contacts in old breakers for the purpose of increasing their rupturing capacities.

In a paper reciting the progress made by operating companies in making stability analyses of their systems, R. McKay and C. E. Cannon, The Washington Water Power Company, drew particular attention to the economics involved in designing for stability. The paper was a complete resume of the work done to date in stability analysis and discussed such elements as the generator size and reactance, inertia, high-speed switching, voltage regulators and high-speed excitation, synchronous condenser, governor speed, neutral impedance, lightning arrestors, and bus arrangement.

Reference to a specific element in system stability was found in a paper by John Bankus, Pacific Northwest Public Service Company, in which was outlined the progress in excitation methods that had been attained.

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Hydraulic Power Committee

E. H. COLLINS
The Washington Water Power Company, Chairman

The establishment of specifications for the fishway at the Rock Island development on the Columbia River, the determination to establish a hatchery below the Ariel Dam on the Lewis River, and various developments in the experiments with the electric fish screen were some of the matters pertaining to the fish-and-dam problem discussed in a progress report by J. E. Yates, Pacific Power & Light Company, bringing the fishway committee report of last year up to date. The Rock Island fishway specifications were established after the examination of models erected at Worcester, Mass., and in general call for a grade of 1 ft. rise to 10 ft. in length with each pool having a dimension of 20 x 10 x 4 ft. deep. The lack of knowledge of the fish life in the Lewis River and the fact that the Ariel Dam is to be followed by three other similar dams farther up-stream led to the abandonment of any attempt to install a fishway or mechanical device for raising the fish at this point. Electric fish screen experiments conducted in the past have led to some permanent installations to keep fish out of certain power and irrigation diversions and further experiments on this device are contemplated for the coming year.

The conditions under which waterwheel runners become pitted and methods of making repairs to pitted runners were discussed in a paper by G. C. Sears, Puget Sound Power & Light Company. The conclusion was reached that pitting resulted from improper design in the effort of manufacturers to produce high specific speed wheels without having carried on sufficient research.

A paper by A. N. Geyer, Utah Power & Light Company, summarized and analyzed the report of the national hydraulic power committee on automatic plants, bringing out the tendency toward a greater use of this type of station. As part of the discussion a written description of how the Drop Plant of the Pacific Power & Light Company near Yakima, Wash., was made semi-automatic was presented by D. R. McClung of that company. C. E. Carey, of the Westinghouse company, urged that plants be designed with the idea in view that they may some day be adapted to automatic or semi-automatic operation through arranging the relays and appurtenances in proper sequence.

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Code Committee

S. B. CLARK
Northwestern Electric Company, Chairman

The first appearance of the code committee in the programs of these meetings was ushered in with a dicussion of the manner in which codes are made and revised, by S. B. Clark, Northwestern Electric Company, and a discussion of the National Electrical Code by Victor H. Tousley, field secretary of the N.F.P.A., read by F. D. Weber, Oregon Insurance Rating Bureau, Portland. In these papers and in the discussion that followed the necessity of close co-operation between the various elements of the industry interested in code making was stressed. H. A. Patton of the Washington Surveying & Rating Bureau, Seattle, urged engineers charged with the responsibility of designing buildings to inform themselves as to the standard set by rating bureaus of the state which, if followed, would lead to low insurance rates.

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Overhead Systems Committee

T. A. PURTON
Utah Power & Light Company, Chairman

The growing use of live-line tools by Northwestern companies in the maintenance of high-voltage lines was told by Walter Smith of the Mountain States Power Company in a paper which discussed the advantages and savings found in this method of line maintenance as against the dead-line method.

C. E. Boggs, Idaho Power Company, discussed distribution grounding problems arising out of the use of artificial grounds, showing charts which gave a graphical method of determining maximum permissible ground resistances on circuits of different voltages. He concluded that best results were obtained from numerous points of injection or the application of grounds over a large area as with water piping systems, and that ground testing procedure should be so simplified that it can be carried on as a routine matter along with other service work. Discussion centered largely around the desirability of grounding in customers' premises.

Exposition of the chemical and physical properties of zinc meta arsenite, the method of treating poles with this substance, and the results, was presented by D. R. Manuel, Curtin- Howe Corporation, Spokane. A low solubility in water and a high toxicity were indicated in the chemical analysis of this substance and have been proved to some extent by the tests made by the Western Union Telegraph Company.

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Meter Committee

A. H. KREUL
Pacific Northwest Public Service Company, Chairman

The stroboscopic method of testing standard meters was explained and a semi-portable set was demonstrated by J. E. Bridges, Westinghouse Electric & Manufacturing Company. It was shown that with this method a periodically interrupted ray of light, controlled by one moving element thrown upon another moving element, created an apparent motion, the direction of which indicated whether the standard was operating fast or slow. This method permits more accurate calibration by eliminating the error created by the personal element in the ordinary method, and saves considerable time through not having to count revolutions of the test meter disk. The principal usefulness is in testing in the factory and where the "as found" accuracy is of little or no importance.

Extensive tests on a variety of types of demand readers, both indicating and recording, were summarized in a paper by L. H. Kistler, Northwestern Electric Company. The per cent registration of demand with different time intervals by different types of meters on the same loads was tabulated and some general conclusions were drawn, among which was the conclusion that the recording-type meter should be universally used on loads having a demand of 100 kw. or higher and could frequently be justified on loads as low as 50 kw. Discussion brought out the fact that demand meter development was at such a point as to make possible the securing of practically any information desired, and that the problem of securing proper revenues was one for the rate engineer rather than the meter man.

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Accident Prevention Committee

J. B. FISKEN
The Washington Water Power Company, Chairman

A study of low-voltage hazards was reported on by G. I. Drennan, Pacific Power & Light Company, in which it was shown that a real hazard from circuits 600 volts or less existed. Seven companies reported 37 accidents in the last two years resulting in twelve deaths. Ways and means of reducing this hazard through better control of the customer's use of equipment were discussed.

How to use, test, store and transport rubber gloves, boots, coats, blankets, pigs and line hose was fully discussed by J. B. Brokaw, Eastern Oregon Light & Power Company. Discussion brought out the practices of companies in glove testing, it being generally considered that routine tests up to 10,000 volts should be conducted every 30 days.

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Prime Movers Committee

C. C. SIMERAL
Pacific Northwest Public Service Company, Chairman

A symposium on the modern trend in the design of steam plants with H. W. Beecher, Chas. C. Moore & Company Engineers, discussing boilers, and J. E. Yates, Pacific Power & Light Company, turbines, composed the program of the prime movers committee. Mr. Beecher sketched the history of the rise of temperatures and pressures in boiler design and indicated the conomies derived from these increases. Mr. Yates also treated turbines historically and showed the enormous progress in size and efficiency made in the past 27 years since the first vertical turbine was placed in commercial use.

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Inductive Co-ordination Committee

H. H. SCHOOLFIELD
Pacific Power & Light Company, Chairman

R. W. Mastick, chief engineer, The Pacific Telephone & Telegraph Company, Seattle, outlined trends in the construction practices of both power and telephone companies which were tending to produce better conditions on telephone lines. He mentioned the use of private rights-of-way for high-voltage transmission lines of power companies and main toll cables of telephone companies as tending to reduce the difficulties of close proximity, but he stated that the tendency toward high voltage of distribution lines, particularly four-wire systems with multiple grounds, was producing a situation requiring close co-operation between the power and telephone interests. In discussion which amplified the points of view of the two interests toward co-ordination, the power interests' point of view was crystalized in the statement that hard and fast rules could not be made covering all situations, but that individual companies should be given authority to modify such rules when such modification seemed advisable.

The first progress report covering experiments being undertaken at the Oregon State College, Corvallis, on radio interference

from high voltage insulators, presented by F. O. McMillan, under whose direction the experiments are to be conducted, brought out the significant fact that radio interference was exactly coincident with the visible appearance of corona. Tests to date have been conducted in the laboratory, but an experimental line 3,280 ft. long has been completed and instruments have been mounted, so that it is expected that the line tests will be commenced immediately. The report outlined a statement of the problem, an analysis of the cause of radio interference from insulators, a discussion of the equipment to be used in the outdoor tests, and an exposition of the preliminary tests already made in the laboratory.

An attempt to find by test the cause of radio interference in 6,900-volt distribution transformers and the remedy finally suggested by the manufacturer was discussed by T. W. MacLean, The Washington Water Power Company. The interference had apparently been due to the use of mica insulation between the high- and low-voltage windings, which, while being satisfactory from an electrical standpoint, still did not provide sufficient separation to avoid a static discharge. The remedy was found in reconnection, using certain additional material, and in reversing the coil ends of the high-voltage winding. Discussion disclosed that other companies had had identical experience with certain types of transformers and that the remedy described in the paper was the best yet devised.

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Public Speaking Finals to Be Held May 17

Finals in the public speaking contest conducted by the Northwest Electrict Light & Power Association will be held in the auditorium of the Public Service Building, Portland, on May 17, under the direction of George L. Myers, chairman of the public speaking committee. Three separate contests will be conducted at the finals: one for the men, one for the women, and a third between the winning man and the winning woman to select the speaker to represent the association in the national contest at San Francisco during the N.E.L.A. convention.

At the time of going to press, the exact number of entries was not known. Some companies have held a single elimination contest in which women have competed against men, and others have held two separate contests and will present both a man and a woman winner. Company participation, however, has been widespread, and a good list of entries is assured. The tentative program calls for the men's contest in the morning and the women's contest and the finals in the afternoon.

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EXECUTIVE SESSION TO BE HELD MAY 17—The executive session of the Northwest Electric Light & Power Association, at which Class A, D and F members may vote for new officers and executive committeemen for the coming year, has been called for 9:30 a.m., May 17, in the conference room of the Public Service Building, Portland. Association officials have made it clear that all members of the association are welcome to attend the session, even though they may not be entitled to vote. The business of the executive session will be expedited as much as possible so that delegates may have an opportunity to attend the public speaking contest to follow.

Meetings

Coming Events

American Institute of Electrical Engineers—Annual Pacific Coast convention, Portland, Sept. 2-5, 1930.

International Association of Electrical Inspectors, Northwestern Section—Annual convention at Hotel Leopold, Bellingham, Wash., Aug. 25-27, 1930.

Southwestern Section — Annual convention at Hotel Maryland, Pasadena, Calif., Oct. 6-8, 1930.

National Electric Light Association—Fifty-third convention, San Francisco, June 16-20, 1930.

Pacific Coast Electrical Association—Joint convention with National Electric Light Association, San Francisco, June 16-20, 1930.

National Electrical Wholesalers Association, Pacific Division—Thrice yearly meeting, Hotel Del Monte, Del Monte, Calif., May 8-10, 1930.

Utah Electrical Men Hold Annual Convention

Sponsored by the Electrical League of Utah, the Ninth Annual Convention of the members of the various branches of the electrical industry in Salt Lake City and adjacent territory was held on April 15 at the Hotel Utah in Salt Lake City.

The wide range of subjects covered by those who addressed the gathering included the following:

"Distribution Systems and Ways and Means to Make the Best Use of Electrical Equipment," by A. C. Kelm, Utah Pwer & Light Company; "Some Recent Electrical Developments," an illustrated review by R. W. McNeill, Westinghouse company; "The Engineer and You," by P. P. Ashworth, Utah Power & Light Company; "Scientific Research," by H. T. Plumb, General Electric Company; "Overhead," by R. C. Nash, General Electric Supply Corporation; "The Electrical Ordinance," by Shirley P. Jones, city attorney of Salt Lake City; "Selling the Electrical Idea to the Public," by Samuel Adams Chase, special representative of the Westinghouse company; "Why Do We Work?" by Adam S. Bennion, Utah Power & Light Company; and "Red Seal Homes," by R. E. Folland, Electrical League of Utah.

A banquet was held in the evening, presided over by J. M. Perlewitz. B. C. J. Wheatlake served as toastmaster, and the speakers included John F. Bowman, mayor of Salt Lake City; W. W. Crocheron, sales manager, Intermountain Electric Company, who discussed "The Wholesaler"; and George M. Gadsby, president and general manager, Utah Power & Light Company, whose subject was, "What shall We Do Next?" The banquet was followed by dancing.

Metermen's Short Course Held at Boulder

The eighth annual metermen's short course took place at Boulder, Colo., March 28-29, under the supervision of Prof. C. M. McCormick, director of the electrical standardizing laboratory of the University of Colorado.

Inspection of the university's laboratory and a trip to the Public Service Company of Colorado's steam plant at Valmont and hydro plant in Boulder canyon were part of the program.

Some of the lecture subjects were, "Value of Demand and Metering," "Economics of Meter Obsolescence," "Application of Radio to Public Service," "Electric Service of Cold Storage Equipment," "Meter Connections," and "Cause and Prevention of Accidents."

V. L. Board, general superintendent of the Public Service Company of Colorado, spoke on "The Trail From Meterman to Executive," and Dean Elmore Petersen of the University Extension Division addressed students on "The Urge to Merge."

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P. G. AND E. CO. ELECTS DIRECTORS—At the annual meeting of the stockholders of the Pacific Gas and Electric Company, John P. Coghlan, second vice-president and assistant to the president, and Charles L. Barrett, assistant secretary, were elected directors in place of John A. McCandless, deceased, and John S. Drum. No other changes in the board were made. The new board met immediately after the stockholders' meeting and re-elected all of the present officers, who are: President, A. F. Hockenbeamer; first vice-president and general manager, P. M. Downing; second vice-president and assistant to president, John P. Coghlan; third vice-president, secretary and treasurer, D. H. Foote; and assistant secretary, Chas. L. Barrett.

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SAN FRANCISCO TO HAVE FIRST AID MEET—The Eighth Annual California Industrial First Aid Meet, and the Seventh Annual Pacific Coast Safety Conference will be held in the Scottish Rite Auditorium, San Francisco, May 14-16, 1930, under the auspices of the California Safety Society. Headquarters have been established at the Palace Hotel.

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TAX OF MUNICIPAL PROPERTY APPROVED—At a recent meeting of the state advisory tax commission in Yakima, Wash., attended by 125 representatives of the Yakima County Farm Bureau, the Grange, and Chambers of Commerce, state taxation of municipal property used by utilities was approved. Municipal property used for power plants or other commercial industries should be taxed, in the opinion of the commission members present.

Personals

Two Officials Promoted by W. W. P. Company

FOLLOWING a meeting of the board of trustees of The Washington Water Power Company, Spokane, held last month, the election was announced of W. F. Miller, auditor of the com-

W. F. MILLER

pany, to the position of comptroller, and of L. E. Morse, formerly secretary and assistant treasurer, to the post of secretary-treasurer.

Mr. Miller has been auditor of the company for several years. In his new position the duties of auditor will merge with those of comptroller, calling for a closer touch with the financial

L. E. MORSE

affairs of the company, in addition to the regular departmental accounting.

Mr. Morse has been with The Washington Water Power Company since 1907. Since that time he has served as collector, cashier, traveling auditor, and assistant secretary-treasurer. In June of last year he was appointed secretary and assistant treasurer, succeeding to the duties of Vincent G. Shinkle, who resigned in December, 1928.

"This is a deserved promotion for both Mr. Miller and Mr. Morse," said M. W. Birkett, vice-president and general manager of the company, in announcing the appointments. "The promotions are in line with the company's policy of filling the higher positions from within its own organization."

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Leo G. Gianini Wins Coffin Award

FOR his achievement in establishing at Stanford University a course in illuminating engineering for upper class mechanical and electrical engineering students, Leo G. Gianini, illuminating engineer of the San Francisco office of the Edison Lamp Works, has been awarded a certificate of merit and a purse under the Charles A. Coffin foundation of the General Electric Company.

Having always felt that the study of illumination was a sufficiently important subject to be included in the curricula of the leading universities of the country, Mr. Gianini in 1927 offered to give several lectures on illuminating engineering to upper class mechanical

LEO G. GIANINI

and electrical engineering students at Stanford. This resulted in an elective course consisting of one lecture a week being introduced during the autumn quarter of that year. The class was attended by 33 students. In 1928 the course was extended to two lecture periods a week, and in 1929 it was made a regular part of the curriculum and Mr. Gianini was appointed a lecturer on illumination.

It is for the work made possible by the excellently planned laboratory developed by Mr. Gianini at Stanford that the Coffin award has been made to him. Here the student may take part in many practical illuminating demonstrations and experiments, for which a vast amount of equipment has been made available.

Mr. Gianini has been in the employ of the General Electric Company ever since his graduation from Stanford University in 1921, first at the lamp factory in Oakland, Calif., and later transferring to the Edison Lamp Works at San Francisco. He is one of 37 men among the 70,000 General Electric employees to receive Coffin awards this year.

Appointed Vice-President of Puget Sound Company

SAMUEL P. MACFADDEN, for the past thirteen years with Stone & Webster, Inc., and associated companies in Texas and Nebraska, recently ar-

SAMUEL P. MacFADDEN

rived in Seattle to take a newly created vice-presidency in the Puget Sound Power & Light Company. He will have charge of sales, advertising and personnel.

Upon his graduation from the Texas Agricultural and Mechanical College as an electrical engineer in 1916, Mr. MacFadden completed a student course with the Westinghouse company at East Pittsburgh, Pa. Following that he went to work for the Eastern Texas Electric Company at Beaumont, Tex. Save for the war period, when he reached the rank of first lieutenant in the A.E.F., he remained with the Eastern Texas company consecutively until 1925, by which time he had become superintendent of the company. In that year he went to Scotts Bluff, Neb., as manager and vice-president of the Western Public Service Company. In January, 1930, he was transferred to the Boston office of the Stone & Webster Service Corporation, but shortly moved West again to take his new position in Seattle.

Mr. MacFadden was president of the Nebraska State Section of the N.E.L.A. during his service with the Western Public Service Company.

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C. E. GRUNSKY, president of the American Engineering Council, was awarded the fiftieth anniversary medal of the American Society of Mechanical Engineers at a recent banquet held in Washington, D. C., to commemorate the fiftieth anniversary of the founding of the society. The medal was one of sixteen awarded to engineers of as many countries, Mr. Grunsky representing America.

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F. E. ROSS, formerly in the advertising department of The California Oregon Power Company, Medford, Ore., recently resigned to become account executive for the Strang and Prosser advertising agency in Seattle.

JOHN H. DOBSON, farmer and sheep man of Tempe, Ariz., has been elected president of the Salt River Valley Water Users' Association, of Arizona. He will succeed on May 5 F. A. Reid, retiring president. C. S. ("Jack") Steward is the new vice-president.

C. B. ("CAP") KENNEY, vice-president and manager, NePage, Mc-Kenny Company, San Francisco, sailed from that city on April 5 on the *Malola* for a trip to Honolulu.

Obituary

Death Takes Dr. Addison, Former G.E. Co. Manager

DR. THOMAS ADDISON, who served for 31 years as Pacific Coast manager of the General Electric Company, with headquarters in San Francisco, until his retirement in 1923, died suddenly in Berkeley, Calif., on April 8 at the age of 76.

Educated originally as a physician, Dr. Addison was graduated from Bellevue Medical College, New York, in 1877, but after eight years gave up his practice to enter the employ of the United States Electric Company of Chicago. In 1888 he became an apparatus salesman for the Thomson-Houston Company in Chicago, and when in 1890 the Western branch of the company was reorganized, he was sent to San Francisco as local manager. Two years later he became Pacific Coast manager of the General Electric Company.

When Dr. Addison went to the Pacific Coast the first electric railway of California was under construction at San Jose, and he had charge of the installation of the Thomson-Houston equip-

DR. THOMAS ADDISON

ment. From that beginning, the company, which handled at first generating equipment and motors, grew rapidly under Dr. Addison's guidance and became an important factor in the development of irrigation and industry. Electricity was put to many new uses, such as the pumping of water and its application in the oil fields.

After 33 years of distinguished service, Dr. Addison retired on Sept. 1, 1923. So intimately had he been connected with the electrical development of the Pacific Coast that his name will stand close to the top of the list of those pioneers whose efforts laid the foundation of the electrical industry in the West.

The following tribute to Dr. Addison was received shortly after his death by J. A. Cranston, vice-president of the General Electric Company, San Francisco, in the form of a telegram from E. W. Rice, Jr., of Schenectady, honorary chairman of the board of the company:

The General Electric Company was most fortunate in having as its leading representative for the development of its business on the Pacific Coast a man of such high character and intelligence as Dr. Thomas A. Addison. He always enjoyed the complete confidence of our officers and directors. It was natural for him to maintain the highest business ideals and at the same time win and hold the respect and admiration of his many customers. He enjoyed the friendship and appreciation of leaders in other important fields of human activity. He rendered a great service to us and to other branches of the electrical industry during the years of his active business life. We all mourn his departure and regret that he was not longer spared to enjoy his well earned rest.

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Cecil B. Merrick Killed by Fall Following Illness

CECIL B. MERRICK, formerly a sales engineer with the South Wesix Heater Comany, Los Angeles, met his death on March 18 in Whittier, Calif., by falling down an outside stair-

CECIL B. MERRICK

way that he had stepped onto from an upper story doorway. Mr. Merrick was just recovering from a nervous breakdown when the accident occurred. Prior to joining the Wesix organization in 1925 he had been with the San Joaquin Light & Power Corporation and the Valley Electrical Supply Corporation for six years, first in inspection work and later in charge of range and water heater sales. Upon his graduation from the University of California in 1914 Mr. Merrick joined the Pacific Gas and Electric Company in San Francisco and remained for three years with that company as a complaint and test foreman. Following that he became successively a field representative of the *Journal of Electricity*, and an instructor in aviation at the Government School of Aeronautics, Berkeley, Calif.

P. R. Ferguson of Southern Sierras Power Co. Dies

PATRICK R. FERGUSON, for the past seventeen years auditor and assistant secretary of the associated subsidiary companies of the Nevada-

P. R. FERGUSON

California Electric Corporation, and vice-president of the Interstate Telegraph Company, died in Riverside, Calif., March 31, at the age of 66, after an illness of several weeks.

A native of Scotland, Mr. Ferguson came to the United States in 1883 and entered the service of a wholesale house in St. Louis, Mo. continuing there in various positions for 20 years. On Jan. 1, 1903, he entered the employ of the Rocky Mountain Bell Telephone Company in Salt Lake City, where he remained until 1912. Then he became affiliated with The Pacific Telephone and Telegraph Company in San Francisco as special accountant. On April 1, 1913, he became affiliated with The Southern Sierras Power Company in Riverside as auditor and assistant secretary of the associated subsidiary companies of The Nevada-California Electric Corporation and vice-president of the Interstate Telegraph Company, positions which he held until his death.

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ANDREW GRAHAM GORDON, for the past seven years connected with the public relations department of the Puget Sound Power & Light Company in Seattle, died at his home in that city on March 29. Mr. Gordon had been the editor of the company's monthly journal for the past year.

BRUCE L. ROBINSON, of Calgary, president of the Bruce Robinson Electric Company, of Alberta and British Columbia, Ltd., died suddenly of a heart attack in Vanvouver, B. C., on April 7 at the age of 61.

C. E. MACNICHOLS, electric appliance sales promotion man for the Blue Bird washing machine and the Servel refrigerator, with headquarters in Seattle, died in that city recently, at the age of 56 years.

Northern Chapter Electragists Plan More Frequent Meetings

EVERY member of the California Electragists, Northern Chapter, becomes a field representative of the organization by the action taken at the Sacramento annual convention of that chapter, held March 29. Under the reorganized plan of operation, without a field force, the plan is to have the membership constitute itself a field force by holding more frequent meetings in the various localities in the northern division.

Thus, with the next meeting, at Oakland, Calif., early in May, will begin the new arrangement.

To this meeting in Oakland members from all parts of the division have been asked to come for an evening session to discuss problems intimate to the contractor only. The meeting will probably be preceded by a dinner.

In this way it is expected that interest will be kept very much alive and that the stimulating effect of more frequent visits from fellow members in other parts of the division will make for a better *esprit de corps*.

The Sacramento meeting proved to be a decidedly earnest one as an interlude between two very enjoyable trips, first up and then down the Sacramento River on the steamer, *Pride of the River*. The boat had been chartered and, therefore, became temporarily the complete possession of the delegates.

An especially pleasing set of circumstances made the boat late in arriving so that much of the trip was spent going up the river during the early morning, Saturday. Usually this trip is made at night and the beauty of the scene is almost entirely lost.

The meeting at Sacramento was presided over first by ex-chairman Edward Martin, Sterling Electric Company, San Francisco, and later by Walter Vance, Pacific Electric Motor Works, Oakland, Calif., chairman of the Northen Chapter.

The Sacramento committee of welcome consisted of George Foss; Jack Kohl, Sterling Electric Company; and J. B. Hawley, of Lupen and Hawley.

Earl Browne, manager of the San Francisco Electrical Contractors & Dealers Association, was in charge of all convention arrangements.

Captain of the destinies of the Northern Chapter is Walter Vance, Pacific Electric Motor Company, Oakland. Mr. Vance is vice-chairman of the California association and chairman of the Northern Chapter

Taking things easy on deck of the "Pride of the River"

At the rail awaiting the arrival of the boat at Sacramento

Ed. Martin, past president

"Look pleasant, please," and they all did

Evidently some "big bidness propolitions" were being discussed

Harry Herning was official musician

Many Cities Adopt the Standard Ordinance

Standard Electrical Ordinances sponsored by the I.A.E.I. are receiving widespread support in southern California. According to James M. Evans, electrical engineer for the Board of Fire Underwriters of the Pacific in Los Angeles, and an active worker on behalf of standard ordinances, the following cities have adopted the ordinance during the last four years: Alhambra, Burbank, Brawley, Anaheim, Banning, Azusa, Calexico, El Centro, Inglewood, Long Beach, Huntington Beach, Fullerton, Monterey Park, Pomona, Ontario, Hawthorne, Manhattan Beach, Santa Barbara, Santa Paula, San Fernando, Santa Ana, San Bernardino, Sierra Madre, Tustin, Riverside, Upland, Glendora, Oxnard, Orange, and Oceanside.

"There are one or two other cities that have adopted some sections from this ordinance but have not taken the whole thing. One of these is Glendale. There have been several others which I have been told have adopted it but they have not as yet sent me copies of their ordinances, therefore I am unable to include them in this list," says Mr. Evans.

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HALVORSON ELECTRIC COMPANY, 274 East Second St., Pomona, Calif., has moved back into its renovated and remodeled store after having established temporary quarters pending completion of the work.

THE SAN JOAQUIN COUNTY Board of Supervisors, at the instance of the San Joaquin Farm Bureau and the Farmers' Mutual Fire Insurance Association, recently authorized its attorney to prepare an ordinance which will provide for county electrical inspection. The number of farm building fires traceable to improper, home-made wiring jobs is given as the reason for the move. The ordinance will provide that all public buildings must be inspected and all others have the inspection available.

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GEORGE ELDRIDGE, formerly field secretary for the California Electragists, Northern Chapter, has established a "Wired Heat Shop" at Hayward, Calif., in conjunction with the Frank Electric Company, of that city. Mr. Eldridge was formerly connected with the Frank Electric and has returned to Hayward to enter business for himself, selling electrical heating and cooking appliances.

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ELECTRIC LABORATORIES, LTD., have been registered at Victoria, B. C., as having offices at 839 West Hastings St., Vancouver. The firm will carry on a general electrical contracting and engineering business, and is capitalized at $50,000.

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JAMES C. ROBERTS of Spokane has received the contract for a decorative curb light system in Okanogan, Wash., including polished spun granite standards.

COLORADO municipalities now without electrical inspection are to be shown the value of adopting the National Electrical Code as a standard for wiring and the necessity of having inspection, if the work of the codes and wiring committee of the Electrical League of Colorado is successful. Outlines of plans for the furtherance of this idea and the improvement of wiring conditions in the state are now being discussed and will soon be acted upon.

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CORRECTION—An error was made in a recent report appearing in these columns in which it was stated that a study of costs of the plumbing business in Oregon was to be made by the Oregon Agricultural College. The survey is being made by the School of Business Administration of the University of Oregon, at Eugene.

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CARROLL & SEARLE, Santa Cruz. (Calif.) electrical contractors, recently completed the installation of the electrically heated Coralitas Union School, totaling 62 kw. The school is electrical throughout.

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JACK KOHL, formerly superintendent for Waxon Bros., Sacramento, Calif., has recently become manager of the Sterling Electric Company of the same city. Edward Cook, formerly Sterling Electric Company manager, resigned to accept a position on the state highway patrol. Mr. Kohl has been an active and energetic Electragist in the Sacramento district for some years.

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SOUTHERN CHAPTER

California Electragists Staff and Headquarters, Los Angeles

BELOW: *Two large rooms in the Cotton Exchange Building house the headquarters of the Southern Chapter, California Electragists. This provides a conference room and office for Mr. Connolly and an outer office and reception room over which Mrs. Kistler presides.*

ABOVE: *The entire staff in person. Left to right are Fred White, secretary, Long Beach branch; Miss Bonnie Howell; T. V. ("Brick") Hunter, staff acountancy advisor to members; Helen Mikesell Kistler, secretary, Los Angeles Class A branch; A. H. Gudie, secretary, Los Angeles Intermediate branch; and Frank J. Connolly, executive secretary, Southern Chapter.*

Ensenada Convention Report

AS this issue of ELECTRICAL WEST goes to press the Southern Chapter annual spring outing and convention to Ensenada, Mex., is in progress, May 2-4. A full report, well illustrated, will be given of the proceedings, and otherwise, in the June issue.

Manufacturer & Distributor

New Electro-Kold President

EDWIN S. MATTHEWS, *formerly general sales manager of the Electro-Kold Corporation, Spokane, who has recently been elected president and treasurer of that corporation. He succeeds Dr. X. L. Anthony, deceased. Other officers of the corporation remain unchanged. They are: H. L. Masterson, vice-president and general manager; L. M. Simpson, vice-president; Lloyd E. Gandy, secretary; and D. W. Mather, assistant secretary and assistant treasurer.*

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TO REPRESENT ILEWILL COMPANY—H. P. Susen has been appointed factory representative of the Ilewill Manufacturing Company, Dayton, Ohio, and has established an office at 3027 Grand Ave., Los Angeles. This company manufactures a line of Bakelite products, including cord sets, plugs, receptacles, plates and similar material, and a stock will be carried in Los Angeles to supply the Western demand.

JESSE E. LAUDERDALE, formerly sales manager for Curtis Lighting Inc., Chicago, who has been in Los Angeles supervising the work of the company in that district, is to remain in Los Angeles as district manager for Curtis Lighting Inc. in the southern California and Arizona territory.

W. B. MICHAELS, formerly manager of Alfred P. Brown, Inc., Seattle, has been named Northwest factory representative of the Ilg Electric Ventilating Company, Chicago, manufacturer and distributor of fans, blowers and electric unit heaters. He will maintain offices at 572 Dexter Horton Building.

JOINS THOR IN NORTHWEST—John Hurley has joined the Seattle sales staff of the Electric Household Utilities Corporation, manufacturer of Thor washing machines. Mr. Hurley is a brother of E. N. Hurley, Jr., president of the corporation, and was recently graduated from Princeton University. He will work under the direct supervision of R. G. Chamberlain, vice-president, who is in charge of all Thor sales in the eleven Western states.

TRAYWAY WASHING MACHINE, INC., San Francisco, Calif., has opened a branch store at 3452 Telegraph Ave., Oakland, Calif. This new store will be under the supervision of J. Patterson, and will employ a sales and office force of from 20 to 25 persons.

MADE NORTHWEST MANAGER OF KELVINATOR—Gordon J. Malone, formerly of Boston, has been named Northwest manager of the Kelvinator Corporation, with offices in Seattle. Mr. Malone is a graduate of the University of Maine, and before coming to Seattle was sales manager in the Boston and New England territory for the Kelvinator company.

Hotpoint's Portland Staff Has Two Additions

The Edison General Electric Appliance Company has expanded its activities in the Northwest by the addition of Burton A. Hall and Joe C. Platt to its sales organization in Portland. Mr Hall will devote his entire time to the sale of water heating. He is a graduate

BURTON A. HALL

JOE C. PLATT

of Washington State College, and for a year and a half prior to his joining the Edison company he was in the commercial department of the Pacific Power & Light Company at Kennewick, Wash.

Mr. Platt has been with the company in the Salt Lake City territory for the past nine years. Prior to that time he was with the Utah Power & Light Company. His work will now be with the power companies and jobbers in the Portland territory.

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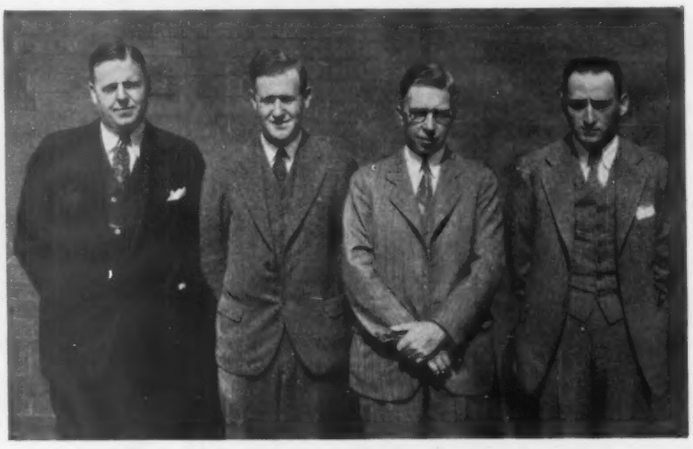
Clark Water Heater Line-Up



PLANS for intensive sales of Clark electric water heaters on the Pacific Coast were put into effect recently when these four gentlemen met in San Francisco at the headquarters of the Graybar Electric Company, distributors of the water heaters in northern California. Left to right they are: A. E. Julian, sales manager, Clark Electric Water Heater Division of McGraw Electric Company, Omaha; R. W. Kimberlin, merchandise manager, Graybar Electric Company, San Francisco; A. H. Nicoll, Graybar sales manager; and H. Layton Pfeiffer, Pacific Coast representative of Clark electric water heaters. Mr. Julian and Mr. Pfeiffer completed their tour of Pacific Coast territory with a visit in the Northwest. Frank Bennett, Portland, is the representative for Clark water heaters in that territory.

New Equipment

1930 Westinghouse Range

"Quick-cook" high-speed platform units are used on all 1930 Westinghouse ranges. A 2,250-watt unit is among the 38 improvements that are features of the new models. Changes in design noticeable in the new ranges are the modernistic lines given to the oven-timer clock; the arrangement of the thermometer, for which the mounting plate has been eliminated; the sloping switch panel, making the switches easier to see; improved door hinges; new construction of legs, with an im-

proved method of bolting them to the baseband; the placing of the appliance receptacle on the switch panel just below the circuit breaker push buttons; and the higher back splasher and more convenient oven height of the Console models. The 1930 range is offered in a choice of green or grey enamel finsh with chromium trim, or semi-white enamel with nickel trim. Its oven size is 16 in. wide x 14 in. high x 17½ in. deep.—ELECTRICAL WEST, May 1, 1930.

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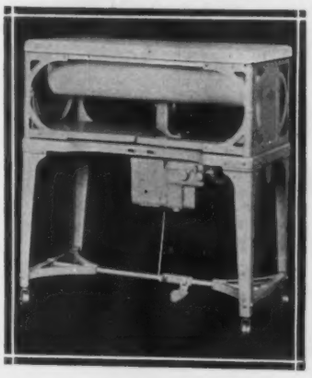
Revolving-Head Flashlight

A unique feature incorporated in a flashlight recently placed on the market by the Burgess Battery Company, Harris Trust Bldg., Chicago, is a 45-deg. revolving head which can be turned at any desired angle for lighting up hard-to-get-at places. The device has a three-position safety switch and is equipped with a belt clip and a garter ring, giving the owner the use of both his hands. Two standard No. 2 uni-cel batteries and a No. 14 Mazda lamp are used in this flashlight.—ELECTRICAL WEST, May 1, 1930.

Universal Ironer



An electric ironer has been added to the Universal line of appliances manufactured by Landers, Frary & Clark, New Britain, Conn. The ironer has full automatic foot control, leaving the operator free to use both hands to smooth and feed the ironing into the machine; 26-in. open-end roll, making it possible to iron cuffs, wristbands, and other circular pieces; chromium plated ironing shoe; and pressing "stop pin" for pressing and steaming. Its hinged feed-board facilitates the ironing and pressing of large, unwieldy pieces. When covered with its porcelain enameled top, as shown, the ironer becomes a useful and attractive kichen table. Total current consumption of the ironer is 1,300 watts; ironing shoe, 1,150 watts. Pearl gray lacquer is used for the finish. The floor space required is 16 x 30 in., and total weight is 210 lb. Retail price, $112.50.—ELECTRICAL WEST, May 1, 1930.

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Water Chiller Installed in Refrigerator

Properly chilled drinking water at the press of a button can now be obtained from the electric refrigerators manufactured by Copeland Products, Inc., Detroit, Mich. The water chiller, which is standard equipment on all de luxe models and optional on other two-door models, consists of a narrow 2-gal. metal tank, concealed behind the center partition between the doors. Water or other beverages are poured into the Chiller through a swivel intake at the top of the tank, and the chilled liquid is removed by means of a button-type faucet which swings out from the lower part of the tank. Both of these swinging units are so designed that they will swing back into place if left projecting from the refrigerator after use. The water chiller, Copeland engineers state, will lower the temperature of any liquid 20 deg. in three hours. The entire unit is easily removable for cleaning.

Another feature of the new Copeland line, standard on all models, is the Coldial, designed to provide manual regulation of freezing speeds in addition to automatic control. It provides seven freezing speeds and is equipped with automatic shut-off which prevents the box temperature from dropping as low as 32 deg. and thus freezing foods. Still another feature is the locked machine compartment. This compartment, housing the compressor unit, is fitted with lock and key.

Unit and box are now assembled complete at the factory, and refrigerators are shipped with cable and plug, ready to run.—ELECTRICAL WEST, May 1, 1930.

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Low-Priced Hotpoint Ranges

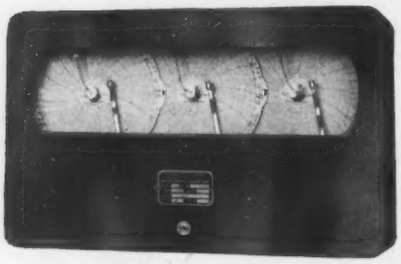
Of standard Hotpoint quality, yet in the low-price field, are five new ranges just announced by the Edison General Electric Appliance Company, 5600 West Taylor St., Chicago.

Automatic heat control, royal blue porcelain enamel lined oven, reversible switches, convenience outlet, three open-coil units and thrift cooker are features of two of the new ranges. Both are of white porcelain with black trim and chromeplate bright parts. These two models vary only in oven size, which in Model RA 48 measures 18 in. wide x 14 in. high x 18 in. deep, and in Model RA 46 is 16 in. wide x 14 in. high x 18 in. deep.

Models RA 36 and RA 34, with the same exterior finish, have all features of those previously described with the exception of the thrift cooker. Model RA 36 has a 16-in. oven, and Model RA 34 a 14-in. oven. The Hotpoint automatic oven timer and modernistic clock can be used with each of these four models.

Described by the manufacturer as a range that answers the question of high cost in addition to economy, speed and faultless operation, Model R 34, of the same construction as other Hotpoint ranges, is finished in black japan and white porcelain enamel. This range has three open-coil units and a 14-in. oven. Neither the thrift cooker nor the automatic oven timer are adaptable to this model.—ELECTRICAL WEST, May 1, 1930.

Triplex Ammeter



A compact recorder for use in unattended substations, furnishing a continuous chart of currents in all three lines of polyphase feeders, is a new triplex ammeter recently added to its line of recording instruments by The Bristol Company, Waterbury, Conn.

The measuring elements in this instrument are of the moving-iron type, the armature taking the form of attracted disks, built up on an alloy selected to give high permeability and low losses. The moving part is carried upon simple-knife-edge springs, and lies in the field of a short compact solenoid. The standard speed for the three charts is one revolution in seven days; a reservoir type of pen is provided, assuring an ample supply of ink for the week's operation. A chart hub is driven through worm gearing from a common shaft, driven by a Warren synchronous motor. Any of the measuring elements or the whole chart-driving mechanism may be removed as a unit, without disturbing the adjustments of other parts of the instrument.

The die-cast case containing the instrument measures approximately 17 x 10½ in., by 5 in. deep. The wiring is arranged for back connection, with studs projecting through the switchboard. It is possible, however, where it is desired to minimize the amount of drilling, to remove the studs and connect directly to the rear of the instrument, there being sufficient clearance between the base plate and the surface of the panel to permit of bringing the leads to a single opening. A single cover, hinged at the top, exposes the whole interior for inspection and for changing the charts. When this is closed the three records are distinctly visible through a glass window of ample dimensions.—ELECTRICAL WEST, May 1, 1930.

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Christmas Lighting

The Darrow Manufacturing Company, 36 East Twentieth St., New York City, has announced its 1930 line of Christmas and decorative lighting appliances, consisting of indoor series sets, outdoor multiple sets, base streamers, intermediate streamers, window electric candles, electric wreaths, twinkle sets, fancy lamps, flashers, extension cords, and other accessories.—ELECTRICAL WEST, May 1, 1930.

Vertical-Surface Floodlight

The Permaflector floodlight FLC-100, originally developed by the Pittsburgh Reflector Company, 304 Ross St., Pittsburgh, Pa., for use on color-lighted towers, provides a means of color floodlighting, or clear white floodlighting, where space limitations prohibit the use of any of the standard floodlights.

The equipment consists of galvanized iron channel to which are attached individual conical spun-copper drums, spaced according to requirements, and containing receptacle, reflector, 8-in. colored glass roundel, and 8-in. clear heat-resisting cover glass. The two sections of the channel are bolted together, and drainage has been provided for by piercing the lower member at

intervals. The channel must be supported by means of special strap iron brackets.

Minimum spacing between units is 9⅛ in. This unit is intended only for lighting of vertical surfaces 12 ft. high or less, from the bottom upward and from a position close to the surfaces to be lighted. A-23, 100-watt inside frosted lamps are used, and four standard colors are available. Units may be ordered on any desired spacing up to 24 in.—ELECTRICAL WEST, May 1, 1930.

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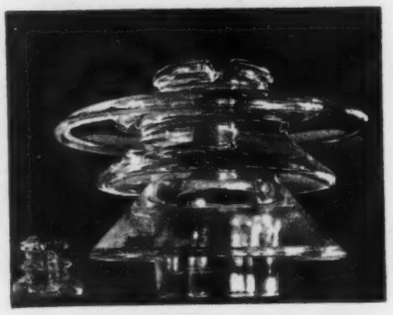
Air-Way Aeriet

Engineers of the Air-Way Electric Appliance Corporation, of Toledo, Ohio, have developed a method of adapting the company's "Aeriet," a concealed heating unit which breathes warmed air into rooms, to heating by electricity. This built-in heating unit heretofore has employed steam or hot water in combination with a noiseless electric fan to radiate the warm air created into the living area of the room, but the system has now been perfected so that the heating unit is supplied with electrical current connections, and in such installations there is no heat-glow to the heating unit. The Aeriet can be manually or thermostatically controlled. It is built in standard sizes to fit between the joists of the building; only two decorative face plates are left exposed, the remainder being covered with plaster or other wall surfacing material. Installation is easy and economical, according to the manufacturer. —ELECTRICAL WEST, May 1, 1930.

70-Kv. Pyrex Insulator



A one-piece, 70-kv. Pyrex insulator, weighing 35 lb., has recently been released for sale by the Corning Glass Works, Corning, N. Y. The addition of this insulator to the Pyrex line makes these insulators available for operating voltages between 6,600 and 70,000 volts.

The qualities of transparency, giving visual indication of the condition of the insulator at any life interval, resistance to power arcs and impulse lightning voltage, elimination of corona and its attendant radio disturbances, and one-piece construction, which characterize Pyrex insulators for lower voltages, are all found in this new insulator.—ELECTRICAL WEST, May 1, 1930.

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Totally-Enclosed Motor

A totally-enclosed, fan-cooled squirrel-cage induction motor with the size advantages of a standard open rated motor, has been developed by the Century Electric Company, 1806 Pine St., St. Louis, Mo. This motor is completely enclosed with ribbed cast-iron coil guards with no rubbing seals or air-gaps; the stator, rotor and other internal parts of the motor are completely isolated from outside air; the fan and fan housing are externally mounted on the front end of the motor—opposite pulley end; and the fan blades are radial. In addition to these features, the air passages are unobstructed, are not easily clogged, and may be readily blown out. Provisions are made to circulate air within the motor shell and transfer the heat to the radiating surfaces where it is carried away and dissipated by the cooling air. —ELECTRICAL WEST, May 1, 1930.

Oil Circuit Breaker for Underground Service

A new manhole oil circuit breaker of moderate interrupting capacity, known as Type M-210, for underground distribution service up to 15,000 volts, has been placed on the market by the Condit Electrical Manufacturing Corporation, Boston, Mass.

The breaker is of sturdy, watertight construction throughout. A massive frame structure, heavily reinforced, supports the operating mechanism, bushings and current carrying parts. In the upper part of the frame space is provided for two bushing-type current transformers per pole in connection with which up to six trip coils can be furnished. Individual tanks per pole are provided of welded steel plate. They are drawn up tightly against the frame by a strong bolt construction. A light, rapidly accelerating mechanism assures high speed characteristics and easy operation. There are no exposed current carrying members above the oil line.

The Type M-210 is furnished manually operated, three-pole, single-throw for 400 amp. at 15,000 volts, nonautomatic or full automatic (trip-free) with an estimated interrupting capacity of 60,000 kva.—ELECTRICAL WEST, May 1, 1930.

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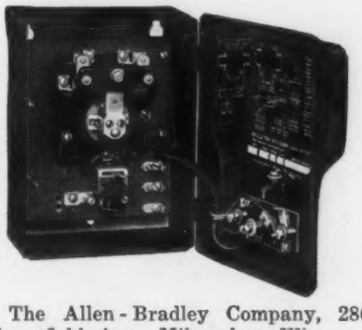
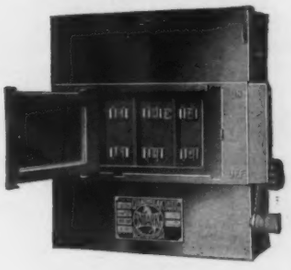
Starting Switch



The Allen-Bradley Company, 286 Greenfield Ave., Milwaukee, Wis., announces a single-phase starting switch for motors operating refrigerating machines, compressors, pumps, oil burners and other motor-driven devices governed by two-wire or three-wire control.

The Bulletin No. 707 is a double-pole magnetic switch with thermal overload relay and has a maximum rating of 1½ hp., 110 volts, and 3 hp., 220 volts. A unique feature of this starting switch is the operating coil which has a double winding for series-parallel connections, permitting the switch to be used interchangeably up to and including 1½ hp. for 110- or 220-volt motors by simply changing the terminal connections of the operating coil. This innovation increases the flexibility of the switch and reduces the number of switches to be carried in stock to meet normal requirements. It can be furnished with start and stop push buttons in the cover, without push buttons, and with two-way lever switch. — ELECTRICAL WEST, May 1, 1930.

"Quadbreak" Switches



In a new "Quadbreak" switch recently announced by Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., the most outstanding feature is the switching action which makes possible four breaks in each pole. This action is accomplished by two contacts fastened in an insulating slide which is guided edgewise between two insulating blocks and moves between two sets of clips. When the switch is thrown "on" the contacts are moved in between the clips and the current passes through, thus completing the circuit. In assembly this switch provides ample wiring space, and in addition, cabinet dimensions of the "Quadbreak" switch have been materially reduced. Cabinets are obtainable with either sealed or accessible cover. Those having an accessible cover are equipped with an auxiliary cover permitting access to fuses without opening the main cover.—ELECTRICAL WEST, May 1, 1930.

Recent Publications

SCREW-CUTTING ENGINE LATHES—Nine-inch and 15-in. metric system precision lathes for cutting international and French metric standard threads from 0.5 to 8 mm. pitch, are fully described and illustrated in two new 20-page bulletins of the South Bend Lathe Works, 409 East Madison St., South Bend, Ind. Its complete line of precision lathes with their tools and attachments is described in this company's recently issued Catalog No. 91-A.

PULLING AND HOISTING TOOLS—The Matthews "Pullift," for pulling slack and lifting heavy weights, and a new fuse puller have been made the subject of a new bulletin (No. 901) of the W. N. Matthews Corporation, St. Louis, Mo.

MAGNETIC CONTROLLER FOR HOISTS—The Wright dynamic lowering circuit for crane operation is described in a recent pamphlet issued by The Electric Controller & Manufacturing Company, Cleveland, Ohio.

FLOODLIGHTING—Several recent booklets describing its floodlighting equipment for special applications have been issued by the Crouse-Hinds Company, Syracuse, N. Y. These include, "Floodlights and Industrial Lighting Units," Catalog No. 312; "A New Floodlight for a Thousand Uses," Bulletin No. 2,201; "Floodlighting for Recreation," Bulletin No. 2,137; "Football Field Lighting," Lighting Data Bulletin No. 2,206; "Tennis Court Lighting," Lighting Data Bulletin No. 2,210; "Gasoline Service Station Lighting," Lighting Data Bulletin No. 2,211; and "Airport & Airway Lighting Equipment," Catalog No. 311.

TERMINAL LUGS — Solderless, compression-type terminal lugs, for use on switches, transformers, and oil circuit breakers, manufactured by the Delta-Star Electric Company, 2400 Block, Fulton St., Chicago, are fully described in Bulletin No. 38-CD recently issued by that company.

ELECTRIC WELDING—"Welding Wire Research," containing a discussion of the proper wire and the proper flame to use in electric welding, is a booklet offered for distribution upon request by the Page Steel & Wire Company, 230 Park Ave., New York.

AIRWAY AND AIRPORT LIGHTING—A comprehensive bulletin, entitled "Lighting Equipment for Airports, Airport Hangars, Landing Fields and Airways," has just been published by the Benamin Electric Manufacturing Company, Des Plaines, Ill.

SAFETY SWITCHES—Catalog No. 226 just issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., covers the complete line of safety switches and motor starting switches manufactured by that company.

COUPLING CONDENSERS—A bulletin describing and listing the Dubilier Type 670 coupling condensers for power line telephony, has just been issued by the Dubilier Condenser Corporation, 342 Madison Ave., New York.

"CELITE FOR CONCRETE"—New material and photographs appear in a revised and enlarged edition of the brochure bearing this title now being distributed by Johns-Manville Corporation, 292 Madison Ave., New York.

"HOW TO JUDGE AN ELECTRIC CLEANER" is the title of a 25-page illustrated booklet being distributed by The Hoover Company, North Canton, Ohio. Three principles upon which electric cleaners are built are described—the strictly suction or ordinary brush-and-suction method, the principle employing a motor-driven brush and suction, and the positive agitation principle.

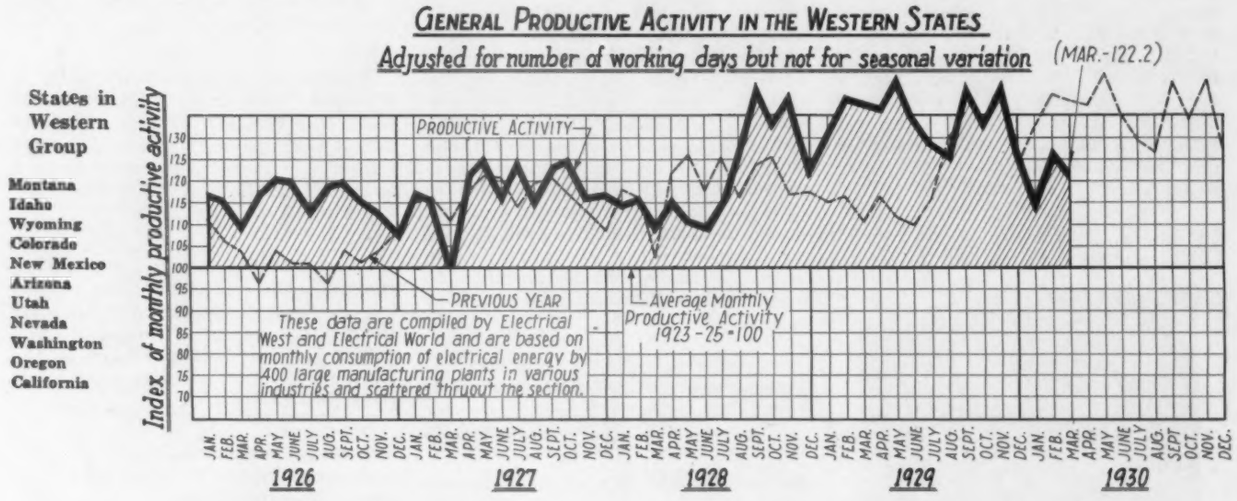
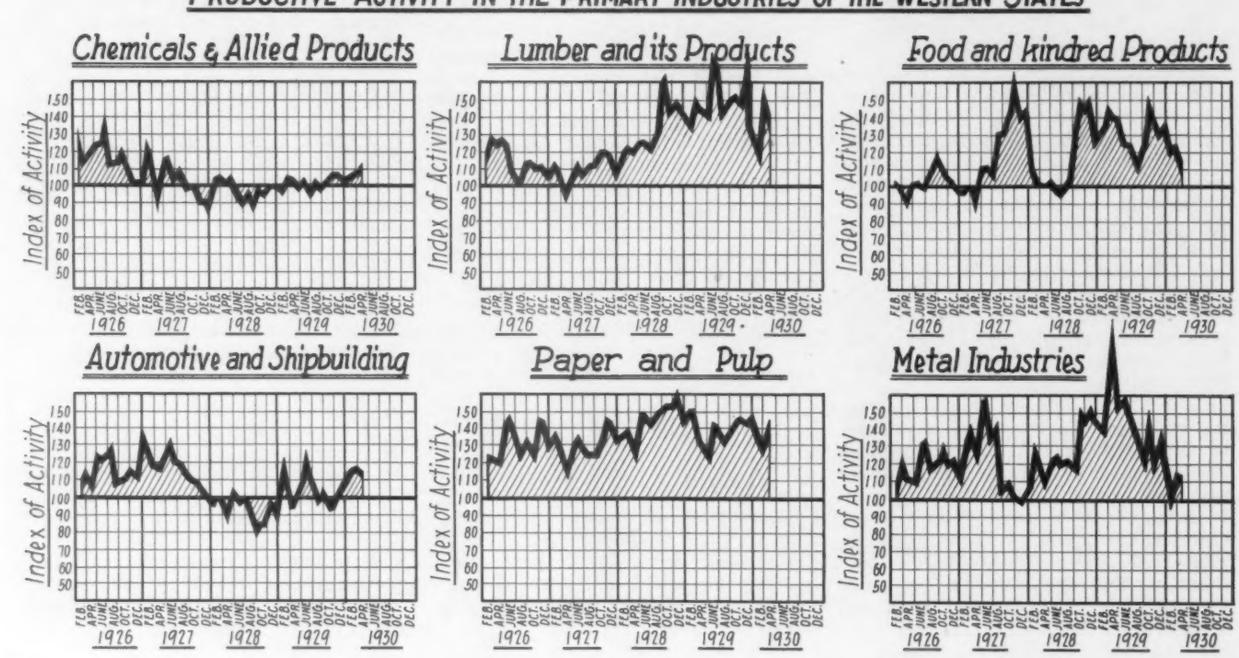
ELECTRICAL WEST Barometer of Industrial Activity in Western States

THE upward trend in general manufacturing in the Western states which was noted in February did not continue during March. Consumption of electrical energy for power purposes by some 400 large manufacturing plants operating in this section indicates that the March rate of operations was 4.2 per cent under February, and 11.6 per cent under March, 1929. The average rate of operations in this section during the first quarter of the year was 11.3 per cent under the same period in 1929.

Current Western manufacturing conditions appear to be on a slightly lower plane than is general manufacturing in the nation as a whole. March operations for the country as a whole were 1.2 per cent above those of February, 7.9 per cent above March, 1929, and the average rate of manufacturing during the first quarter was 9.4 per cent under the same period last year. During the quarter manufacturing operations were generally conducted on cautious and conservative schedules, only a few industrial groups witnessing the increases normal during this quarter of the year.

Four of the industrial groups of the Western states reported an increased rate of operations during March, as compared with February, and four reported decreased operations for the same period. Only three industrial groups—chemical products, paper and pulp, and shipbuilding—reported current March operations above those of March, 1929. The chemical products industry is the only one reporting increased operations for the first quarter, as compared with operations during the same period last year.

Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days)

	Mar. 1930	Feb. 1930	Mar. 1929	Average 1st 3 months 1930	Average 1st 3 months 1929
All industry	122.2	127.5	138.2	121.6	137.0
Chemicals and allied products	113.2	109.8	95.6	110.1	96.5
Food and kindred products	114.9	126.5	142.6	122.6	143.4
Forest products	141.2	155.3	147.2	140.8	146.2
Metals group	113.9	116.4	206.8	108.3	172.0
Paper and pulp	145.5	130.6	135.4	137.8	146.5
Rubber and its products	167.2	164.0	200.7	168.4	200.7
Shipbuilding	115.2	117.5	94.1	116.6	133.3
Stone, clay and glass	103.4	95.2	131.3	101.7	133.6